For CONTENTS, see pages iii and iv of Cover.

pp. 535-594.] [November 30, 1913.

TROPICAL DISEASES BULLETIN

Vol. 2. 1913. No. 11.

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OF THE

TROPICAL DISEASES BUREAU.

General Editor:
THE DIRECTOR OF THE BUREAU.

COMMONWEALTH MYCOLOGICAL INSTITUTE
26 MAY 1971

London:
TROPICAL DISEASES BUREAU,
Imperial Institute, S.W.

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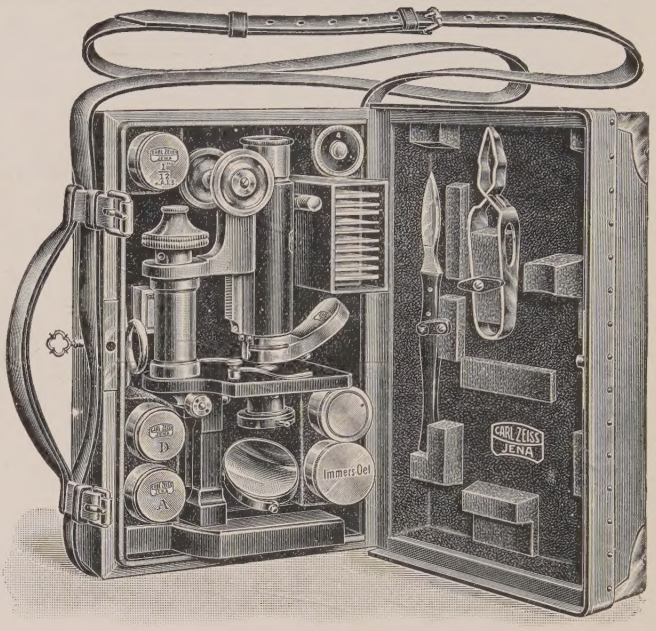

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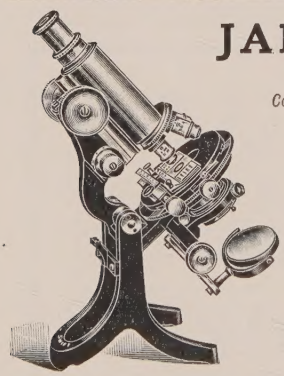

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TROPICAL DISEASES BUREAU.

TROPICAL DISEASES BULLETIN.

Vol. 2.] 1913. [No. 11.

MALARIA.

BAHR (P. H.). **Malaria in Kurunegala.**—8 pp. F'cap. With 11 photographs and 1 map. (Report dated April, 1913, forwarded from the Colonial Office).

Kurunegala is a town situated in one of the rice-producing districts of Ceylon, and this most interesting report, which is furnished with an excellent map and several good and instructive photographs, gives an account of what was found in the course of a seven days' survey of the town and vicinity in February and March of this year. Some of the information has also been derived from the more extended experience of the local native medical officer.

The weather at the time of Dr. Bahr's visit was abnormally dry, the paddy fields lay fallow and there were few mosquitoes about and little actual fever in evidence. A great deal of valuable information was, however, collected which may be considered under different headings and in some detail.

(a) *The Main Species of Mosquito conveying Malaria.*

In the following list, which gives all the various species of Anopheles found in Kurunegala in the order of their frequency, those known to be carriers of infection are printed in heavy type:—*Anopheles barbirostris*, *rossii*, **sinensis**, **culicifacies**, **fuliginosus**, *jamesii*, *punctulatus*, **maculatus** *vel* **Willmori**, **albirostris**, **listonii**. It is chiefly in India and Malaya, that the five [six?] "carrier" species were found to be so. It was not possible to obtain this proof at Kurunegala for there are special difficulties regarding the experimental transmission work in Ceylon. These are stated by the author whose assistant found adult anophelines during the daytime in houses and bungalows in the town. They were never discovered in station bungalows, where malaria is very prevalent, and this is thought to be due to the mosquitoes retiring to neighbouring jungle during the day. Bahr was unable to find any anophelines in the daytime in the houses of Habage village [see map].

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(b) *The Areas in which these Anophelines breed.*

1. *Paddy fields.*—These extend over an area of about 300 acres within town limits. The majority are only operative at certain seasons when flooded and especially when the water is subsiding. Some, irrigated from town wells and from a tank, are nearly always under water.

2. *Tanks.*—A main and bathing tank. Both are stocked with fish and consequently free from larvae.

3. *Irrigation Channels,* when badly graded or dammed up by natives.

4. *Rock Pool,* due to rain water and heavily infested. Its condition improved when fish were put in it.

5. *Borrow Pits,* now, thanks to the anti-malarial operations, almost inoperative.

6. *Freshwater Wells.* 180 in number, 18 of which contained a few larvae. Larvivorous fish having been introduced they can now be disregarded.

7. *Rock Stream* with stagnant pools in the dry season. *A. barbirostris* found in them and one specimen of *A. maculatus* vel *willmori.* The natives dam the stream to form a bath for their bulls, a practice to be forbidden.

8. *Water Channels on each side of Railway Cutting.* These are not kept clean, and are overgrown with Spirogyra, etc., forming excellent feeding grounds for larvae. This and the continually flooded paddy fields are most to blame.

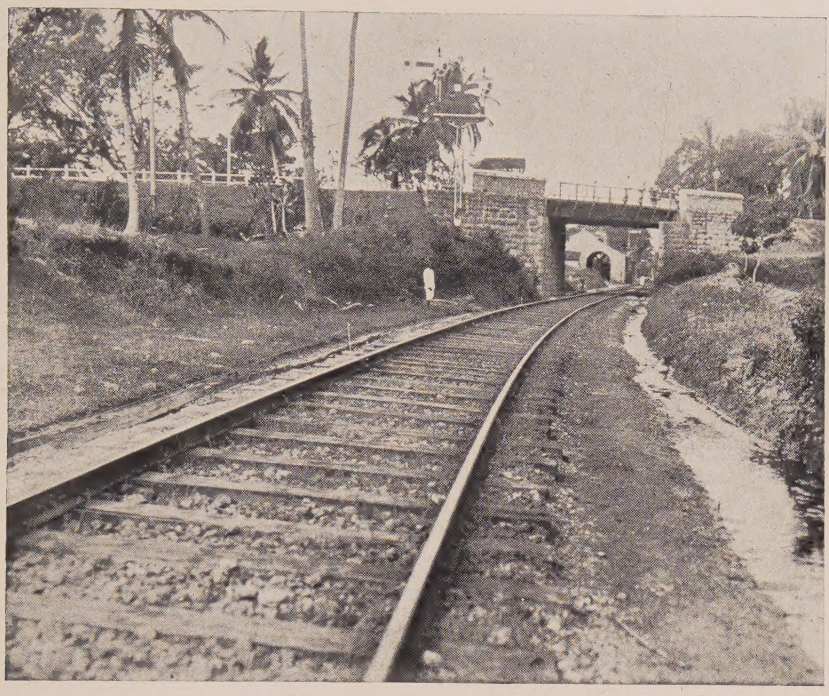
The following table is interesting.

	Nature of Breeding Ground.		
	Paddy Fields.	Rock Pool.	Railway Cutting.
A. barbirostris	19	47	—
A. rossii	26	42	14
A. sinensis	15	7	—
A. culicifacies	3	—	7
A. fuliginosus	1	—	—
A. jamesii	2	—	—
A. punctulata	1	—	—
Total examined ...	67	96	21

Four species of larvivorous fish are found in the flooded paddy fields:—

"(*a*) 'Pathia' (*Barbus stigma*), a most efficient larvivore;
(*b*) 'Dandie' (*Rasbora lanicornius*);
(*c*) 'Sudaya' (*Dania malabaricus*); and one, a bottom feeder;
(*d*) 'Ahirawa' (*Lepidociphalicthys thermalis*)."

They are carried to the fields from the tanks by irrigation channels. It is thought that some are carried to remote blocks as spawn on the feet of water birds. Provided there is sufficient water they seem to multiply. It appears they only feed on live larvae and many of the latter have therefore adopted the habit



RAILWAY CUTTING. Water-course flowing on each side of the permanent way; supplying engines with water. These channels are blocked with weeds, from amongst which larvae of *A. culicifacies* and *A. rossii* have been taken.

FLOODED PADDY FIELDS. (Opposite the Railway Station.) Water supplied from Wenaruwewa tank. This picture shows in the foreground the pools formed by the hoof marks of cattle; in these Anophelines breed.

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of shamming dead and may thus escape. Larvae however exist along with the fish, and Bahr's explanations of this fact are:—

"(*a*) Larvae are generally found in the 'seepage' water which has filtered through the bunds leaving the fish behind.

"(*b*) In the larger pools which form in the paddy fields the larvae are found at the edges of the pools, while the fish keep the centre.

"(*c*) Holes formed by the feet of cattle (*vide* photo), and into which the fish are not able to enter, are ideal breeding places, and in these anopheline larvae are invariably found."

Frogs abound but do not appear to feed on the larvae at all. There is a note to the effect that the commonest larvae with cannibalistic propensities are those of *Culex tigripes*, a common mosquito in the roofs of native houses.

(c) *The Effect of these Areas on the Prevalence of Local Malaria.*

The degree of infection in children under 14 years of age was taken as an index of the general population and a spleen survey was undertaken and microscopical blood examination conducted. In the 435 children examined the total spleen rate was found to be 34·7 per cent. and was higher in males than in females. [The variations met with in different localities are best studied in the map to which notes have been added briefly explaining the conditions].

The blood of all the 435 children was systematically examined. Malarial parasites were only found 45 times. The mean parasite rate for the whole town was 10·5 per cent. At H [see map] where the spleen rate is highest the parasite rate is low, an anomaly accounted for by various factors. Save in two instances the infection was slight, so possibly cases were overlooked. None of the children had fever at the time of the examination and indeed they looked remarkably healthy. Gametocytes were the forms chiefly found. The quartan parasite predominated though all three species of malarial parasite were present. Crescents were only found on three occasions. Of special interest is the fact that parasites were found in the blood of 15 children in whom *no concomitant enlargement of the spleen could be detected.*

There are some notes on the results of systematic treatment with quinine, from which it would seem that it effected considerable improvement in the spleen rate. Bahr's recommendations may be quoted in full as they apply in large measure to many other malaria-stricken localities in the Tropics.

"(1) Abolition of paddy fields within town limits.

"(2) Systematic treatment of all school children with quinine during their attendance at school. This practice to be continued for two years after the abolition of paddy fields. Enforcement of the Town Schools Ordinance of 1908.

"(3) Cementing all drains and waterways in the town, and more especially the streams in the railway cutting. These drains, after being cemented, must be systematically cleansed of all vegetable growth.

"(4) Stringent rules to prevent natives from blocking up streams and irrigation channels for the purposes of washing cattle or of catching fish.

"(5) Bund of channel from Wenoriwewa tank which supplies engine sump and paddy fields near station to be kept in repair to prevent leakage.

"(6) All irrigation channels should be properly graded so as to serve as outlets for storm water. In this respect the irrigation channel behind the station yard requires attention.

"(7) No borrow pits to be excavated within town limits without permission of the Local Board, who alone ought to be responsible for this work.

"(8) Rules to enforce adequate disposal of recently opened and discarded coconuts for drinking purposes. Owing to the abundance of firewood in Kurunegala, these shells are not used for fuel as elsewhere. In the spacious hollow water collects and forms an ideal breeding ground for all species of mosquito.

"(9) Enforcement of a 'Cattle Straying Ordinance.' Could cattle be prevented from straying into paddy fields, the 'goiyas' would then be able to reside at a greater distance from their work. At present, although realizing in some instances that these situations are unhealthy, they are unable to move further away on account of the damage to their crops arising from stray cattle."

It is proposed to substitute the planting of coconuts, a lucrative occupation, for the rice cultivation. Some useful appendices complete the report.

[This paper is well-nigh a model one of its kind but it is unfortunate that the total population is not stated, and that nothing is said about the influence of mosquito migration or, save as regards a brief note on rainfall, concerning the meteorological conditions. The report, however, is admittedly only of a preliminary nature. It cannot fail to be of great service to those whose duty it is to cope with malaria in irrigated districts].*

A. Balfour.

James (S. P.) & Gunasekara (S. T.). **Report on Malaria at the Port of Talaimannar.**—11 pp. F'cap. Illustrated. 1913. Colombo: printed by H. C. Cottle, Government Printer. [Ceylon. xxxiv. 1913.]

Talaimannar is the terminus in Ceylon of the new railway to India. It is on the small island of Mannar, a map of which appears in the Report. The district has always been regarded as one of the most malarious in Ceylon and is liable to flooding, the subsoil water being very near the surface. The yearly rainfall averages about 37 inches, most of the rain falling from

---

* The author has furnished further useful particulars which may be tabulated as follows:—

Size of area under consideration = about 4 square miles.
Area of rice fields within town limits = 500 acres.
Area of inhabited part of town (bazaar) = 15 acres.
Area of large irrigation tank = 104 acres.
Population (1911 census) = 8,163.
Average temperature = 79·8° F.
Mean Annual Rainfall = 80·52″.
Rainy months = April, May, October and November.
Height of rocks behind the town = Over 800 feet. These somewhat influence the temperature.

Kurunegala (pronounced "Corrygalle") is the capital of the North Western Province of Ceylon. At present it is a railway centre and is also the centre of an important agricultural district (rice and coconut cultivation). It will become more important as a labour-distributing centre when the Mannar Railway is completed. The maximum malarial incidence generally occurs three months after the heaviest rainfall and about two months after the hottest period of the year. In 1911 a total of 175 deaths was attributed to malaria in the district. A more elaborate report will be forthcoming at a later date.

A. B.

Map of Kurunegala Town.

Showing Distribution of Malaria and Breeding Places of Anophelines.

Scale about 3½ inches to 1 mile.

A, B, C, etc. = Different collections of houses where observations made.

Note that people in houses close to paddy fields are chiefly affected.

In area H children of good social status and well fed, but spleen-rate high, 68·1 per cent.

In area A and K houses scattered and so chance of infection less.

In area C only a few children examined and these but recently arrived. Hence no malaria found.

Area F much more lightly infected than area G, probably because belt of trees intervenes between them and F is further from paddy field and close to tank kept free by fish.

Low index in ill-kempt bazaar children in area L explained by distance of latter from paddy fields. [Some notes, however, on the habits of the children would have been useful. Do they not wander afield in charge of cattle, etc.?]

[*To face p.* 538.

LOCAL BOARD LIMITS
KURUNEGALA TANK
SLUICE
BARBIROSTRIS SINENSIS ROSSII
ROCK POOL
Dambulla Road
GOVT AGENTS RESIDENCE
AN BARBIROSTRIS MACULATUS
Kachcheri
Rock Fortress
ANDA GALA
To Dambulla
KURUMINIA GALA
BAZAAR STREET
MALGAWA ROAD
WATTIMA LANE
BUDDHIST TEMPLE
GETTUANA BAGALA VIHARA
STUPS
POND
ETHA GALA
KURUNEGALA ROCK
TRIG. PILE
1
C 0%
D 26·3 %
B 26·3 %
PADDY
AN BARBIROSTRIS
SINENSIS
ROSSII
CULICIFACIES
FULIGINOSUS
JAMESII
PUNCTULATA
E 66·6 %
A 48·9%
HABAGE
Kandy Road
Stream Irrigation Channel
Railway Station
Railway Cutting
THELLIAGONNA
AN ROSSII CULICIFACIES
To Kandy
To Wenoruwewa Tank
LOCAL BOARD LIMITS

October to January. The mean annual shade temperature is nearly 83° F., but variations occur both in rainfall and temperature, and the authors state that in the tropics it is usually the case that abnormal meteorological conditions of any kind are adverse to the population. In the Mannar district the latter are for the most part wretchedly poor and ill-fed Ceylon Tamils and Moors engaged in agriculture and fishing. Statistics show a rapidly falling birth-rate, a high death-rate and a heavy infantile mortality both in the Mannar district and in the Mannar island division. The chief cause of sickness and mortality is malaria, and when speaking of respiratory diseases the authors mention that in India there is a close association between malarial infection and fatal lobar pneumonia. A considerable proportion of the deaths in Mannar being ascribed to malarial cachexia, the authors thought it well to exclude kala-azar. This they were able to do. A spleen-rate and a parasite-rate were worked out. The latter was found to be considerably lower than the former (36 per cent. as against 58 per cent.). Of the parasites found 71 per cent. belonged to the quartan type. It seems clear that malaria is accountable for the deplorable state of the district.

Other interesting particulars are furnished. As regards the anopheles factor, *Myzomyia culicifacies* is probably the mosquito chiefly to blame but seven species of anopheles occur. The important part played by the social and economic conditions of the community is insisted upon. Amongst other things these may favour relapses so that a very few anopheles may suffice to maintain a high parasite infestation. The question of the introduction of non-immune immigrants is fully discussed as is the influence of the rainfall. A recurring epidemic is usually superimposed annually on the endemic malaria and the definite relationship of this epidemic prevalence to the rainfall is shown graphically by means of a chart. Before passing to the question of preventive and curative measures the authors uphold the view that unless attempts are made to prevent or minimize the effects of the floods other methods are unlikely to prove successful. The chapter on prevention is both interesting and instructive and will be found specially valuable by those engaged in railway extension work in the moist tropics. It is, unfortunately, impossible to review this section in detail here. A matter, however, meriting more than a passing reference is the question of housing for a European Staff. According to the authors the following principles should guide those responsible.

"(1) The houses should be, as a rule, square, and may be of one or two storeys.

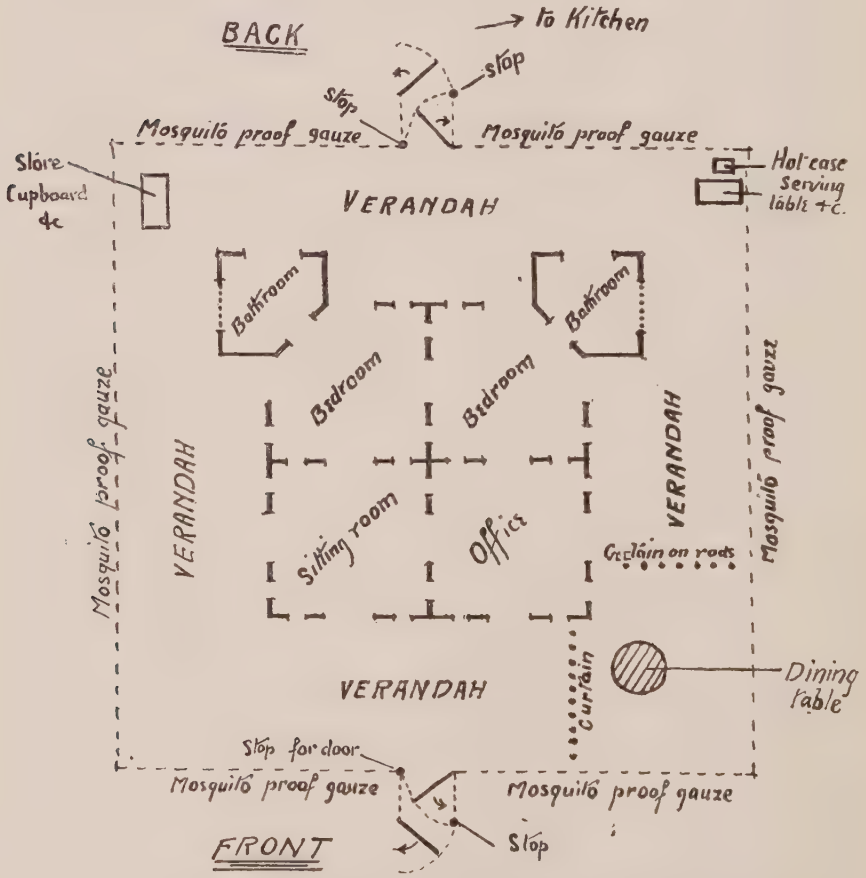
"(2) They should be raised from the ground, preferably on an extensive plinth of concrete surfaced with cement.

"(3) The whole area of the plinth should be utilized for the erection of a large mosquito-proof 'shed,' inside which the house proper will be built.

"(4) The 'shed' consists of the following parts:—(a) Pillars of iron, stone, or wood, erected at the corners and along the outer limits of the plinth to support the roof; (b) between the pillars a dwarf wall, and upon it a framework filled in with mosquito-proof copper wire gauze of 18 meshes to the inch; (c) at two places in the skeleton walls double doors, mosquito-proofed, and both opening outwards. They should be made to close automatically (N.B.—It is essential to the success of mosquito-proofed houses that all doors should open outwards); (d) a ceiling of wood

or of asbestos material, resting on and closely applied to the top framework and girders in such a manner that the roof is completely shut off from the remainder of the shed; (e) a sun-proof and rain-proof roof, which is ventilated, and of which the eaves project as far as possible beyond the framework and are not provided with gutters—the rain dripping from them being allowed to fall into a concrete drain laid all round the house; (f) the result is a large square mosquito-proof structure with walls of mosquito-proof wire gauze, a ceiling of wood, and a floor of cement, and the whole covered by a roof; (g) all that now remains to be done is to reserve a broad space all round inside the structure to serve as a verandah, and then to partition off the remaining space into rooms. It is not necessary for these partitions to be very solid structures, and they should be opened wherever possible by large arches and windows. Doors to the arches are not necessary. It is important that no partition should be built which will cut off a through draft of air from front to back and from side to side of the house. (h) The house should be orientated so as to obtain the greatest advantage from the winds of the south-west and north-east 'monsoons.''

The accompanying plan is reproduced as it is likely to be useful. There is a careful criticism of the faulty type of house



Plan of four-roomed house suitable for residents in malarious districts.
(The large openings are archways, the small ones are windows.)

previously adopted. The reason why doors should not be made to open inwards into rooms is because mosquitoes resting on the

outside of such doors will be brushed into the room along with the person entering—a point worth remembering but often forgotten. A mosquito catcher is recommended as a profitable asset.

A final note states that the borrow pits are not so much to blame as has been supposed, but, quite apart from malaria, they are very insanitary and should be abolished. As the port is likely to become important "hydraulic fill" operations may eventually be required on the lines of those employed at Panama and elsewhere.

A. B.

Sarkar (Sarosi Lal). **Investigations into the Incidence of Malaria in the Town of Arambagh, Hooghly District.**—*Indian Med. Gaz.* 1913. Sept. Vol. 48. No. 9. pp. 342-346.

This paper embodies the results of an enquiry at Arambagh into the relative liability of Hindus and Mohammedans as well as of different Hindu castes to malarial infection. This was carried out by conducting a spleen census of children between two and twelve years of age. In the different wards of the Municipality 1,721 male and female children were examined while for comparison of race and caste 379 Mohammedan and 1,338 Hindu children came under observation. The latter part of the investigation was important because it is generally believed that, in Bengal, the Hindu populations are being wiped out by epidemic malaria at a greater rate than the Mohammedans populations. The author found scarcely any difference between the spleen rates for Hindus and those of Mohammedans. [Unfortunately he does not classify the degree of splenic enlargement recognised nor explain fully how the enquiry was conducted although it would seem that kala-azar cases were excluded]. He thinks that the table comparing race and castes shows (1) that the prevalence of malaria in a caste is in accordance with the economic conditions of the caste. The better these are the greater the resistance to infection; (2) that the castes which perform out-door work are less liable than those whose occupation lies indoors.

A. B.

Satyaranjan Sen. **Some Observations on the Aetiology of the Malaria in Bengal.**—*Indian Med. Gaz.* 1913. Aug. Vol. 48. No. 8. pp. 303-305.

The author seeks to show that in Bengal the conditions commonly considered as favouring the prevalence of malaria, *i.e.*, the presence of jungles, water-logging of the soil and defective drainage, the existence of partially dried up rivers and canals and of pits, holes, tanks and borrow-pits, apparently do not influence the distribution of the disease. He bases his argument on "spleen censuses" in children under twelve carried out in different localities. He found villages near each other in which malaria varied in degree and intensity independently of such causes. There is less malaria in the new villages where there are better houses and a higher standard of comfort.

A. B.

Adie (J. R.) & Mrs. Adie. **Note of an Inquiry into Malaria and Mosquitoes in the Kashmir Valley.**—*Indian Med. Gaz.* 1913. Sept. Vol. 48. No. 9. pp. 341-342. With 1 map.

This paper is practically the same as that reviewed in this *Bulletin*, Vol. 2, p. 315, but a map showing the mountains and rivers connected with Kashmir is appended.

A. B.

Brünn (W.) & Goldberg (L.). **Die Malaria Jerusalems und ihre Bekämpfung.** [Malaria in Jerusalem and its Control.]—*Zeitschr. f. Hyg. u. Infektionskr.* 1913. Aug. 27. Vol. 75. No. 2. pp. 209-235. With 25 text-figs.

Jerusalem is a city of, approximately, 70,000 inhabitants, comprising about 45,000 Jews, 10,000 Mohammedans and 15,000 Christians. There are also many pilgrims. Although 750 metres above sea level and possessed of a good climate it is a most unhealthy spot. This is due to the great poverty of the majority of its populace and to the slight interest in hygienic matters hitherto shown by the Turkish authorities. The authors give an account of the truly deplorable sanitary, or rather insanitary, state of the city, and especially of the old town. It is illustrated by numerous and excellent photographs. Thanks to the philanthropy of Nathan Straus of New York it has been possible to institute an anti-malarial campaign in Jerusalem and the authors give a most interesting account of its prosecution.

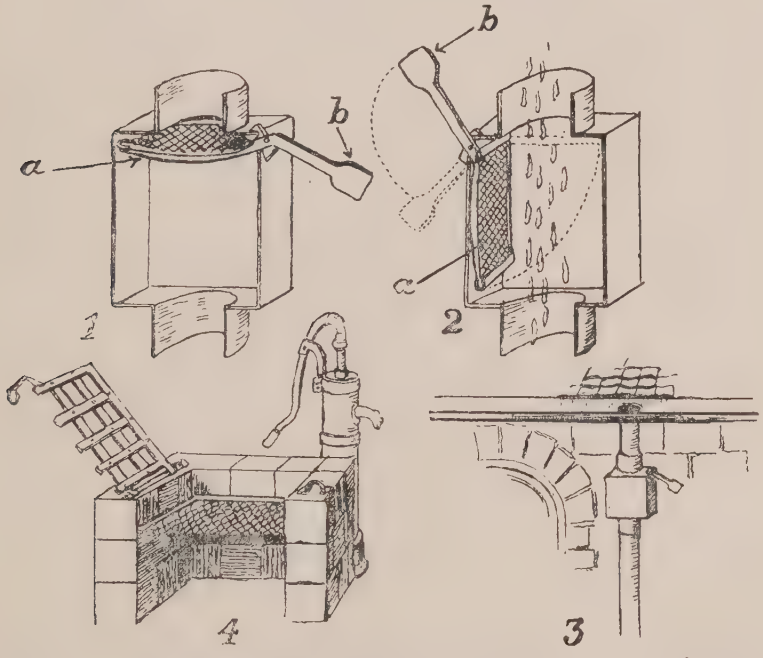
Naturally it is chiefly of local interest, but much that they say applies to other towns in the Near East.

In the summer Anopheles were found breeding only in the water cisterns, which are such a feature of the city and which are most carefully described and figured. Although there are several large open water basins anopheles larvae were never found in them. In two instances their absence was attributed to the presence of fish. Only in the pool of Bethesda were larvae (Culex) found. In the winter and spring, however, pools and puddles form after heavy rain and these harbour numerous mosquito larvae, including anopheles. The cisterns are of a peculiar type and serve for the storage of the rain water which at the present time constitutes the drinking water supply for the inhabitants. These cisterns are sometimes very large, 4, 5 or 6 metres deep, are built of stone and are situated in the courtyards or the basements of the houses. They are frequently in a very bad state of repair, and are rarely provided with pumps, the water being usually obtained through a well mouth by means of a bucket. The well mouth is generally enclosed in a raised stone coping and is very often only protected by an iron grating through which mosquitos readily gain access to the water. In some instances solid hinged well-fitting metal lids are provided, but both lids and grating are in use more to prevent the precious water being stolen than from any sanitary consideration. Owing to various defects all manner of filth frequently finds its way into these cisterns. In addition to the mosquito work the authors instituted a spleen survey from which they conclude that out of every five of the inhabitants three show splenomegaly. Full details are

given regarding 616 cases examined. Of these 365 or 59 per cent. showed splenic enlargement, and these are classified according to the grade of splenomegaly present, four degrees of enlargement being recognised. From August 20th to January 15th an examination of the blood for malarial parasites was made in the case of 2,055 persons. In 442 or 21·5 per cent. the result was positive. In other words every fifth inhabitant during summer and autumn harbours malarial parasites in his blood. The following table gives the types of parasite found.

70 cases	= 16 per cent.		Benign tertian.
94 ,,	= 21 ,,	,,	Quartan.
265 ,,	= 60 ,,	,,	Tropical (malignant).
13 ,,	= 3 ,,	,,	Mixed infection.

The cases are also classified according to age and locality. The authors point out that the only way of combating malaria on a large scale in Jerusalem is by a crusade against mosquito larvae, although in certain parts destruction of the imagines by fumigation or spraying may be practised with advantage. Quinine prophylaxis for the whole town is out of the question, being too costly and too difficult to carry into effect properly. At the same time, where possible, it is not to be neglected. The mosquito campaign practically resolves itself into a proper covering of the rain-water



Figs. 1, 2 and 3.—Apparatus for fixing in rain-pipes to prevent ingress of mosquitoes to cisterns.

Figs. 1 and 2 are sectional views of the apparatus illustrating mode of working. (In Fig. 2 the diagram is transposed to shew the valve open.)

a, valve of zinc-coated wire netting; *b*, weighted arm to keep *a* in horizontal position, thus closing the opening. The weight of the rain on *a* causes the valve to open; when the rain ceases the valve is automatically closed again by the counterpoise *b*.

Fig. 3 shews apparatus in position on rain-pipe.

Fig. 4.—Method of screening large air vents or well mouths.

cisterns, petrolage for those containing dirty water, and also for all pools and puddles. Each rain water cistern should be provided with a pump, the well mouth being tightly covered and the rain pipe carried through the cistern wall and properly built into it. All holes must be closed up. The authors have invented and figure an apparatus which can be fixed in the rain pipes to prevent the ingress of mosquitoes to the cisterns while presenting no barrier to the rain. They have also devised a method of screening the large air vents or well mouths which serve some of the cisterns.

As they point out, these measures should greatly improve the general health of the inhabitants. In addition to malaria, dengue, enteric fever and dysentery should all diminish. The ideal sanitary reform for Jerusalem would be the provision of a proper piped water supply. At present there is no hope in this direction so that the methods described must be adopted in their entirety.

A. B.

Leger (Marcel). **Le Paludisme en Corse.**—*Ann. Inst. Pasteur.* 1913. Sept. Vol. 27. No. 9. pp. 765-793.

This is to all intents and purposes the same paper that was reviewed in this *Bulletin* Vol. 2, p. 215. It should, however, be noted that an examination for infected Anophelines was made in the region of Aleria which is the most malarious in Corsica. Of 295 *Anopheles maculipennis* collected from three different localities and examined by Sergent's method only seven were found infected, a percentage of 2·37.

A. B.

Falcioni (Domenico). **Sulla Localizzazione della Malaria alle Abitazioni.** [On the Restriction of Malaria to Habitations.] —*Policlinico.* Sez. pratica. 1913. Aug. 3. Vol. 20. No. 31. pp. 1119-1122.

The author points out that in all regions where malaria prevails its incidence in particular houses or streets of a town can be demonstrated, showing that infected mosquitoes never move far from spots where they can find human beings on whom to feed. Shepherds in remote parts of the Roman Campagna can sleep out at night with impunity in spite of the prevalence of mosquitoes, because there are no human beings affected with malaria in the vicinity, from whom the parasite could be conveyed.

A. B.

Peall (P. A.). **An Inquiry into the Effects of Malaria upon the Health of our Mine Native Labourers.**—*Med. Jl. of S. Africa.* 1913. August. Vol. 9. No. 1. pp. 6-9.

As the native labour for the mines in Southern Rhodesia is wholly recruited from so-called "Tropical Boys," *i.e.* labourers coming from districts within the tropic belt, the author thought it advisable to conduct an enquiry into the incidence of malaria amongst these labourers and also into the effect of chronic

malarial infection upon their blood-forming organs and their powers of resistance to other diseases. Out of a total of 102 blood films examined parasites were observed in 46 cases = 45 per cent. Many of the cases of malaria were undoubtedly relapses due to change in residence, fatigue and chill. Particular attention was paid to the presence and character of the degenerative changes in the red cells and more especially to the occurrence of the large, pale, semi-lunar red corpuscles first described by Brumpt. Degenerative changes were found in 68 films = 66 per cent. The relative proportion of large mononuclear leucocytes and the presence of malarial pigment in these cells were also noted. The author is of opinion that the blood degeneration was evidence of a chronic malarial infection and that the degenerative changes, so induced, very probably had a debilitating effect upon the general health and efficiency of the natives, rendering them less resistent to bacterial invasion. He found that an adequate administration of quinine caused a speedy disappearance of the half-moon red cells from the peripheral blood, and he advocates the exhibition of quinine prophylactically combined with tonic treatment in the case of all labourers during their sojourn in detention camps and while travelling to the mines.

A. B.

Gobert (E.). **Quelques Aspects du Problème Antipaludique en Tunisie (1912).**—*Arch. Inst. Pasteur Tunis.* 1913. No. 1/2. pp. 121-128.

This is a paper by the chief of the Anti-malarial Service in Tunis giving an account of the condition of several districts which are heavily infected by malaria although some of them differ greatly in their general features. The article possesses only local interest save perhaps the part which deals with the construction of the large drainage canal in La Mabtouha, an undertaking which has proved of great benefit both from an agricultural and sanitary standpoint. A reference is given to a memoir on the subject written by the engineer in charge of the work. It is evident that the campaign against malaria is being actively prosecuted in Tunis, all known methods being employed though, in some districts, quinine prophylaxis is the only feasible measure.

A. B.

O'Connell (Matthew D.). **The Meteorology of Malaria.**—*Jl. Trop. Med. & Hyg.* 1913. Sept. 1. Vol. 16. No. 17. pp. 257-260.

The author suggests that certain meteorological conditions by themselves, in Calcutta and places with a similar or nearly similar climate, can, at certain seasons of the year, produce a fever resembling malaria. Further he apparently considers that such conditions may be responsible for the intermittent pyrexia, haemolysis and splenomegaly which are so characteristic of malaria and which are usually attributed to an unknown toxin. [This, however, as Brown has indicated may be hematin—see this

Bulletin, Vol. 2, pp. 341, 342.] In support of his view O'Connell has compiled tables showing hourly atmospheric conditions at Calcutta in March and September, 1912, and they are compared with atmospheric conditions which raised body temperature in Lancashire cotton-weaving sheds. [As, however, no one is likely to accept the author's views in their entirety it is perhaps unnecessary to review the paper in detail.]

A. B.

Knab (Frederick). **Anopheles and Malaria.** — *Amer. Jl. Trop. Diseases & Preventive Med.* 1913. Sept. Vol. 1. No. 3. p. 227.

The author corrects some errors in the paper which was reviewed in this *Bulletin* Vol. 2, p. 317. The corrections do not apply to any of the points considered in that review.

A. B.

Diagnosis.

Fróes (João A. G.). **The Rapid Diagnosis of Malaria.**—*Jl. Trop. Med. & Hyg.* 1913. Sept. 1. Vol. 16. No. 17. p. 272.

The author gives details of a modified Cropper's method (*British Medical Journal*, 1912, Apr. 20, p. 890) of staining thick blood films in malaria. His technique is as follows:—

(*a*) Make very thick films with five large drops of blood.

(*b*) When the blood has dried, stain it for two minutes with Gasis's solution:—

Methylene blue	...	...	...	1 grm.
Hydrochloric acid	...	...	...	0·5 cc.
Alcohol	...	...	...	10 ,,
Distilled water	...	...	...	90 ,,

(*c*) Wash carefully, dry and examine with $^1/_{12}$″ oil immersion. The good results obtained are said to be due to the fact that the staining takes place at the same time as the acid solution acts on the red cells dissolving their haemoglobin. The whole malarial parasite is visible, not only the pigment as in the case of Cropper's method.

A. B.

Acton (Hugh W.) & Knowles (R.). **The Diagnosis of Latent Malaria.** — *Indian Jl. of Med. Research.* 1913. July. Vol. 1. No. 1. pp. 167-176. With 9 charts.

This is the paper reviewed in the *Bulletin* Vol. 2, p. 321. The charts, nine in number, have now been added and will be found useful by anyone studying the article.

A. B.

Clinical and Treatment.

Bates (J. P.). **A Review of a Clinical Study of Malarial Fever in Panama.**—*Jl. Trop. Med. & Hyg.* 1913. Aug. 15. Vol. 16. No. 16. pp. 241-245.

This is the fourth section of the above review and is concerned with the question of relapse. The author points out the difficulties attending a research upon relapse in malaria. It is not

easy to exclude reinfection as shown, for example, in the case of three persons who suffered from apparent relapses until their quarters, which had been recently screened, were thoroughly fumigated when they at once ceased to get fever. At the same time it was possible to obtain a certain number of cases suitable for prolonged observation. Three chief types of relapses are mentioned: —

1. Those occurring in children, always impatient of control, and in adults whose duties force them to commence work too quickly after subsidence of the fever. Here the relapses occur at short intervals and would seem to bear some relation to the thoroughness of the quinine treatment in the primary invasion or in the succeeding attacks. If the treatment is efficient relapse does not occur.

2. Those in people living in malarious countries who may suffer from several attacks of malaria and who finally reach a stage where they can live in a malarious country in apparent good health but relapse as soon as they go to a cooler latitude or cooler climate even when they have been taking quinine prophylactically. Such relapses may be separated from each other by periods of five, six, or eight months and sometimes even longer.

3. A doubtful group where the relapses are separated by periods of several years. Bates does not believe that these are true relapse cases but admits that the question is still *sub judice*.

He goes on to consider the four theories hitherto advanced in order to explain the mechanism of relapses, *i.e.* (*a*) residual parasites which have survived the effect of quinine and continue to develop in the usual asexual cycle (Ross); (*b*) parthenogenesis of sexual forms (Schaudinn); (*c*) intra-corpuscular conjugation (Craig); (*d*) sexual development in the human host *e.g.* fertilisation of female crescents by the male crescents and subsequent segmentation (Thayer). The last is based on the work of Rowley-Lawson.* The author discusses all these views at some length and in an interesting manner, citing especially the work of Darling at Panama in 1909 on malaria "carriers." The original must be consulted by those interested, but with the evidence before him and as a result of his own observations Bates agrees with Ross that every circumstance favours the view that residual parasites are responsible for relapse. In the case of the other theories, even if the phenomena described do occur and have been correctly interpreted, their relation to relapse is merely conjectural. On the other hand it is known that the parasite of the asexual cycle can survive over indefinite periods of time, and it seems reasonable to suppose that, though they may be so few in numbers as not to be detected by our existing methods of examination, they can remain and multiply slowly until favourable conditions bring about their rapid increase and hence a true malarial relapse.

A. B.

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* *Jl. Experimental Medicine.* 1911. Feb. 1. Vol. 13. No. 2. p. 263.

Swellengrebel (N. H.). **Schizogonie der weiblichen Gametocyten von *Laverania malariae* (Tropica-Parasit).** [Schizogony of the Female Gametocytes of *Laverania malariae*.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Aug. 4. Vol. 70. No. 3/4. pp. 179-181. With 1 coloured plate.

The author points out that Ross denies the occurrence of parthenogenesis in the female gametocytes of *Pl. vivax*, as originally described by Schaudinn in 1903. Swellengrebel asserts that while parthenogenesis of female gametocytes has certainly been found in the case of benign tertian infections it has never been described in the case of the quartan parasite, while, so far as the tropical parasite is concerned, the only positive observation is that of Neeb in 1909. [He seems to have overlooked papers by Harrison and Karrewij in this connection.] Ross did not confirm Neeb's findings and, at the time, Swellengrebel agreed with Ross, but he has recently altered his opinion. This is the outcome of observations made in the case of a Chinaman admitted to hospital for malignant malaria at Deli on the east coast of Sumatra.

In this patient's blood, stained with Giemsa in such a way as to prevent overstaining of the chromatin, (one drop of stain solution in 1 cc. aq. dist. and allowed to act for 10 minutes) he found small rings, fully developed vegetative parasites, and all the stages up to normal schizogony, adult male and female crescents, and young crescents still enclosed in the red cells. These, together with the so-called schizogony of the female crescent, are illustrated by a coloured plate. He describes the ordinary vegetative [asexual] forms and their schizogony and then points out that the young crescents in the red cells can be distinguished from the asexual parasite by the fact that their cytoplasm takes on a less deep shade of blue and has a violet tinge, that their pigment is diffuse, and that their nuclei are less sharply defined. The plate illustrates the development of the young, spherical macrogamete first into endoglobular and then into free crescents. [It cannot be said, however, that the drawings are altogether convincing. Certainly that of a fully developed free crescent differs from one's usual conception of such a form even though it is true that the gametes of *L. malariae* do not always present a typical crescentic shape.]

There follows an account of the changes preceding schizogony in these young endoglobular forms. The chromatin becomes more or less scattered or arranged in a long streak. The streak or band divides to form two nuclear masses while the diffusely scattered chromatin breaks up into several portions. These eventually coalesce to some extent so that the mature crescent is multi-nucleated. The cytoplasm retains the violet-blue colour and the pigment remains diffuse. As a rule the crescents continue in the red cells but they may become free. Some of the chromatin usually remains in the form of a streak or of fine threads. Finally a stage prior to schizogony and like that found

in the ordinary asexual cycle is reached, the chromatin and pigment concentrating at the centre of the parasite but the concentration of pigment is never so marked as in the usual asexual cycle. This fact, the peculiar colour of the cytoplasm, the size of the parasites in relation to their host cells, and the peculiar arrangement of the chromatin differentiate this crescent schizogony from that of the vegetative forms. The author, like Maurer, has twice seen a multiple division of the chromatin in a *fully developed* crescent, but he cannot look upon this as evidence of schizogony for no further stage could be found.

He concludes by mentioning some of the possible fallacies already alluded to by Neeb. He found no evidence of a mixed infection and so can exclude a schizogony of the sexual forms of benign tertian or quartan parasites. The features described seem to put out of question an ordinary, vegetative schizogony while the number of nuclei found does away with the possibility of the appearances noted being due to a premature formation of male gametes, a phenomenon which has now and again been observed in the peripheral blood. Hence he believes he is justified in concluding that he has witnessed a true schizogony of young crescents in a case of infection by *L. malariae*.

A. B.

da Matta (Alfredo A.). **Pneumo-paludismo Asthmatiforme.** [Malarial Pneumonia of an Asthmatic Type.]—*Rev. Med. de S. Paulo.* 1912. Oct. 31. Vol. 15. No. 20. p. 397.

The author was summoned to visit a youth of 18 years of age, who was suffering from a violent attack of fever, the temperature being nearly 40° C. In addition the patient was cyanosed, and the respiration asthmatical. Pain was complained of over the area of the right lung, and physical examination revealed dulness on percussion along with tubular respiration and other signs of congestion. The liver was also tender and enlarged, and the spleen palpably hypertrophied, while the urine contained albumen and an excess of urea.

As the locality in which the patient resided was malarious and no further information as to the nature of the case was forthcoming, a hypodermic injection of quinine was tentatively given, along with dry cupping to the region of the lung. On the next day, to the surprise of the reporter, the condition was found much ameliorated and the patient had a normal temperature. The blood was then examined and found to contain *Plasmodium falciparum*. The patient, being now in a condition to explain, related that he had had a similar seizure about two months previously, for which he had been treated by a medical man with various remedies without success. Seeing that the paroxysms showed a decided tendency to periodicity, the patient was persuaded by a friend to take certain capsules at the rate of three a day, whereupon improvement ensued. On the strength of this history the treatment with quinine was continued and the patient speedily recovered.

A. B.

da Matta (Alfredo A.). **Anosmia palustre.** [Malarial Anosmia.] —*Rev. Med. de S. Paulo.* 1912. Dec. 31. Vol. 15. No. 24. p. 483.

A married woman, aged 25, residing in the suburbs of Manaos, sought advice for pains in the head, violent at times and extending to the eyes and nose. They were always most intense on rising in the morning and lasted till 10 or 11 o'clock, after which the patient considered herself free. During the attack there was no sensation of fever, but great languor and indisposition to exertion. What most impressed the patient and led her to seek advice was a loss of smell, which manifested itself in the course of cooking meals. Physical examination of the nose and pharynx showed nothing abnormal, but the loss of olfactory power was undoubted. The temperature was normal and the blood contained no parasites. Nevertheless, the patient having suffered from malarial fever in the past, a diagnosis was made of malarial neuralgia of the fifth nerve with anosmia as a complication, and upon this hypothesis treatment was initiated with a dose of 30 centigrammes of hydrochlorate of quinine three times daily. The result was a brilliant success, both neuralgia and anosmia disappearing on the fourth day.

A. B.

Audiau. **Paludisme à Forme Hépatique.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 454-455.

A soldier at Tuyen-Quang had quartan malaria which was apparently the sole cause of an enlarged, painful and congested liver. There was no previous history of dysentery. Quinine cured both the fever and the hepatic condition. Quartan fever is rare in French Indo-China and at first the diagnosis was difficult, as there was nothing to suggest the real cause and bacteriological examination proved negative.

A. B.

Dagorn. **Cas d'Hémoptysie Paludéenne.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 451-452.

A soldier at Hagiang, French Indo-China, with no evidence of tuberculosis or any pulmonary disease was found to be suffering from severe haemoptysis during attacks of tropical malaria. The haemorrhages were unassociated with cough and there was no sputum.

A. B.

Lugo-Viña y Carta (Nicasio). **La Tifomalaria y su Terapéutica Clinica.**—*Semana Medica.* 1913. Sept. 25. Vol. 20. No. 39. [No. 1028.] pp. 714-717.

The author recognises that a malarial infection may be superimposed on one due to the Eberth-Gaffky bacillus and *vice versa*. He deals with the difficulties of diagnosing such a hybrid condition. While he supports Collet's dictum to the effect that

microscopic blood examination and the Widal test can alone make the diagnosis certain, he thinks that in many cases "the clinical eye may be substituted for the microscopic lens." Many cases of typho-malaria would seem to commence with intermittent pyrexia and end in a similar manner. The termination in cases of recovery is most frequently by lysis. The author enters very fully into the question of treatment. He begins by exhibiting calomel alone or in combination with rhubarb and magnesia. Jalap may be substituted for the rhubarb. In the case of children he employs only calomel and magnesia. Later, for three or four consecutive days he administers quinine by intramuscular injection. Then follows a day without injection when a mild purgative water, such as Rubinat, is given. This is followed by three or four more quinine injections. When the temperature rises above 38° C. he gives antipyretics, more especially antipyrin together with bromide of sodium or potassium. He thinks intestinal antiseptics of value in certain cases and is accustomed to give benzonaphthol, or, if the urinary system requires attention in this direction, salol and benzonaphthol. These may be taken with bicarbonate of soda or along with a medicated water suited to the prevailing conditions. Thus if gastric symptoms predominate *Vichy* is indicated, if hepatic *Celestins*, if renal *Grande-Grille*. As the fever declines the author employs a mixture of arsenic and quinine and, where necessary, tonics and stimulants. One may note his use of iodine in potassium iodide locally to prevent septic infection after quinine injection, and, in lieu of baths, for sustained high temperature the employment of the wet sheet which has been soaked in aromatic vinegar. Children, after debilitating sweats, benefit from a shampoo with alcohol, or water and alcohol combined.

The use of tepid or cold enemata for reducing high temperature is also mentioned as is the question of diet and beverages. The value of sunlight and an open air treatment during convalescence receive due notice.

A. B.

Annales d'Hygiène et de Médecine Coloniales. 1913. July-Aug.-Sept. Vol. 16. No. 3. pp. 781-783. [Clinique d'Outre-Mer.] **Extrait du Rapport du Médecin Chef de l'Ambulance de Langson.** [Malarial cachexia: pp. 782-783.]

An account of a spontaneous sub-capsular rupture of the spleen in a case of malarial cachexia. The patient, an European, had been seventeen years in Cochin-China, the last three of which had been spent in Tonkin. During this latter period he had suffered from severe headaches, loss of memory, broken sleep and some vertigo. These symptoms latterly increased in severity, he became troubled by nightmares and passed into a slight and intermittent state of low delirium. The clinical signs are mentioned, but there is nothing to note save that on December 8th there was a very marked rise of temperature and on the following day a violent dyspnoea ensued, the respirations being 60 to the minute. The heart failed; inhalations of trinitrine gave no relief and, though morphia eased the dyspnoea a little, the patient died an hour and a half after the beginning of the dyspnoeic attack.

The spleen, which presented an extensive, sub-capsular rent, weighed 590 grammes and its pulp was of the consistence of pap. The liver was much enlarged and the condition was plainly one of malarial cachexia.

A. B.

Davidson (Wilson T.). **A Case of Spontaneous Rupture of the Malarial Spleen: Splenectomy.**—*Texas State Jl. of Med.* 1913. Sept. Vol. 9. No. 5. pp. 151-152. With 1 text-fig.

The causes favouring rupture of the spleen in chronic malaria are, in addition to hypertrophy, changes both in the parenchyma and the capsule. The pulp becomes soft and diffluent, the capsule distinctly sclerotic. Adhesions to neighbouring organs also tend to form. The condition is rare, only three cases out of 30,000 cases of malaria being reported from the Colon Hospital during a period of eight years. The author describes a case from the Philippines under his care in Texas where splenic rupture took place without any definite trauma having occurred. Splenectomy was performed and the patient recovered. It is pointed out that in addition to the symptoms of internal haemorrhage one is led to a correct diagnosis by the presence of pain in the splenic region and of flatness upon percussion in the more dependent portion of the abdominal cavity. Stress is laid on the importance of the symptom noted by Ballance, *i.e.*, both flanks are dull upon percussion when the patient lies on his back. When he turns on his *left* side the right flank becomes resonant because the blood is free. When, however, he turns on his right side the left flank does not become resonant owing to the blood clots held by the intestinal folds. When this symptom is present a positive diagnosis of splenic rupture can be made. If it is absent, there may still be an injury of the spleen. A list of symptoms following splenectomy, but gradually disappearing, is given. Of these may be mentioned a tenderness along the long bones, said to be due to active changes taking place in the marrow which is assuming the function of the spleen.

A. B.

Bates (John Pelham). **A Review of a Clinical Study of Malarial Fever in Panama.**—*Jl. Trop. Med. & Hyg.* 1913. Oct. 1. Vol. 16. No. 19. pp. 297-301.

Continuing his dissertation on malaria the author has now reached the subject of treatment. He points out that in estimating the effect of quinine one must take into consideration the tendency of cases of malaria to recover naturally. Two cases, apparently the same in every respect, may run very different courses, the one recovering without treatment, the other tending to show pernicious symptoms. In both temperate and tropical climates most cases tend to terminate favourably in from 10 to 15 days or at the most in 20 days. Thirty grains would seem to be the average daily dose of quinine generally recommended but the drug must be increased in quantity to meet the gravity of the infection. Bates finds that it is perfectly safe to give much

larger doses than are usually advised, and in grave cases in Panama the doses given largely exceed the 40-45 grains mentioned as a maximum in the text-books. The routine treatment there adopted is to give 20 grains in solution on admission and thereafter 30 grains daily. For the therapeutic test 45 grains a day are sometimes given for one or two days and then the usual 30 grains daily. In grave and pernicious cases it may be necessary to increase the dose to from 60 to 90 grains. Indeed Bates has given as much as 120 grains in the first 24 hours, but it is important to note that *massive doses must not be continued longer than 24 hours.* As a matter of fact cases requiring more than 80 grains within the first 24 hours are usually fatal within this period. If massive doses are given the quinine should be reduced after 24 hours to 45 grains. This dose may be continued for 24 hours or 48 hours and then a further reduction to the usual 30 grains is indicated. In cases where the peripheral blood is freed from parasites, and this means that the circulation generally has been cleared of them, but where the gravity of the symptoms continues to increase, the quinine should be rapidly reduced in quantity as in such cases it does no good and will not prevent death. The author gives the following as indications for increasing the dose of quinine:—

1. A large number of parasites in the peripheral blood. It must, however, be remembered that the mere number of parasites present is no guide to the severity of the case.

2. The characteristics of the parasite present. For example, in quotidian and subtertian infections the occurrence of presegmenting and segmenting forms in the peripheral blood is usually a grave symptom.

3. The state of the blood. When the blood exudes with great difficulty from the pricked ear or finger and when it is dark in colour, clots quickly and spreads unevenly over the slide one suspects blocking of capillaries or malarial toxaemia. In such cases intravenous injections of 20 grains in 10 cc. saline solution are indicated. The author has no experience of quinine given intravenously in large dilution as employed by James.

4. What may be called "pernicious aura" [A.B.], *i.e.*, mental aberration, inability for consecutive thought, defective memory as regards the details of the illness, sometimes moroseness or mental dulness, vague wanderings away from the bed, &c.

When these signs appear push the treatment even if there is only a moderate infection in the peripheral blood. Give 45-60 grains in the first 24 or 48 hours.

The time of day for the administration of quinine is considered. The author is partial to a dose twice daily, both doses being given in the forenoon, say 15 grains at six and another 15 grains at eleven o'clock. Such a method is less troublesome for the patient and ensures the quinine being in greatest concentration in the blood about the time sporulation most frequently occurs. It thus has a chance of acting vigorously on the young parasites. If 45 grains have to be administered give this quantity in three doses; if 60 grains, in four doses. Where larger doses are indicated 10 grains may be given every 2 or 3 hours as required.

Method of administration.—Bates agrees with Rogers and Thayer who consider the intramuscular injection method inferior to administration *per os*. He finds quinine given in this way is absorbed slowly and sometimes scarcely at all. Despite all aseptic precautions indurations and abscesses may occur. He concludes therefore that injection is not a method of election but of necessity, *i.e.*, it is useful in pernicious cases. So long as the patient can swallow he gives quinine by the mouth. Even when vomiting is troublesome it is well to persevere, repeating the dose and, if necessary, aiding its retention by a small hypodermic injection of morphia, the application of sinapisms to the epigastrium, &c. Although he does not condemn the intravenous method he fights shy of it, having been rendered timid by serious results in a case in which it was employed. He reserves it as a last resort. As regards hypodermoclysis [subcutaneous injection in large dilution] he says that James has now abandoned this method as it causes too much pain and in some cases the temperature persisted in spite of it. Bates himself does not now employ it.

Turning to the question of preventing relapse he advocates a modification of the interrupted method of quinine administration originally introduced by Marchiafava and Bignami. By this means the tendency to produce strains of the parasite feebly "fast" to quinine is averted. A certain amount of intelligence on the part of the patient is required as will be evident from the following details:—From the last day of the febrile attack count 7 days, note this date and also each seventh day thereafter for 6 or better 8 weeks. On the day before the 7th day take quinine in full doses, usually 30 grains *per diem* and continue this dosage throughout the 7th or "pivotal" day and the day following it [*i.e.*, for three consecutive days]. Discontinue and resume at the next period.

Bates concludes by stating that in his experience the effect of large doses continued over long periods is practically *nil*. He mentions a case where by mistake 30 grains of quinine were taken daily for seven months without any ill effect. Tolerance was speedily established and no harm of any kind resulted.

[This useful paper has been reviewed at some length for it discusses certain questions often ignored by the text-books or on which they give forth an uncertain sound. At the same time all will not agree with the author's views on the value of intramuscular injections. It is curious that he does not mention the salt of quinine which he usually employs, but possibly a discourse upon the merits of different preparations is reserved for a later paper].

A. B.

Laboratory and Experimental.

Thomson (John Gordon & David). **The Growth and Sporulation of the Benign and Malignant Tertian Malarial Parasites in the Culture Tube and in the Human Host.** — *Proc. Roy. Soc.* Series B. 1913. Oct. 1. Vol. B 87. No. B 592. pp. 77-87. With 1 coloured plate.

A very interesting and well illustrated paper which increases our knowledge both as regards the culture of malarial parasites

and their morphology. It is convenient to give in the first instance the author's summary of their work.

(1) "The malignant tertian parasite has been successfully cultivated after the method of Bass and Johns on twelve occasions, and the benign tertian on three.

(2) "It is unnecessary to remove the leucocytes from the blood before incubation. The optimum temperature would appear to be about 38° C., and the parasites may grow successfully at a temperature as low as 36° or 37° C.

(3) "The time required for the full development of the parasite *in vitro* varies, but this variation is partly due to the age of the parasite at the time of incubation.

(4) "The cultures of benign tertian differed from those of malignant tertian in that there was no tendency to clumping of the parasites in the former, either before or during sporulation.

(5) "This difference appears to us to explain in a satisfactory manner why only young forms of malignant tertian are found in the peripheral blood, as the clumping tendency of the larger forms causes them to be arrested in the finer capillaries of the internal organs. It also explains the tendency to pernicious symptoms, such as coma, in malignant tertian malaria. All stages of the benign tertian parasite are found in the peripheral blood, and there are seldom pernicious symptoms, because there is no tendency to clumping.

(6) "The malignant tertian parasite (*P. falciparum*) is capable of producing in maximum segmentation, 32 spores. On the other hand, benign tertian (*P. vivax*) produces, as a rule, during maximum segmentation, 16 spores; sometimes more may be produced, but the number is never 32.

(7) "The pigment in *P. falciparum* collects into a definite, circular, and very compact mass early in the growth of the parasite. On the other hand, during the growth of *P. vivax* the pigment remains scattered in definite granules throughout the body of the parasite, till just before segmentation, when it collects into a loose mass of granules in the centre of the full-grown *Plasmodium*.

(8) "The morphology of *P. falciparum* and *P. vivax* in the human host is identical with the morphology of these parasites as obtained in the culture tube."

Of the above conclusions those relating to the culture work were reached by the employment of a slight modification of the original technique employed by Bass and Johns. It is as follows:—

"10 cc. of blood is drawn from a vein and transferred to a sterile test-tube containing a thick wire leading to the bottom of the tube from the cotton wool plug. 1/10 cc. of a 50-per-cent. solution of glucose is added to this tube, preferably before adding the blood. The blood is defibrinated by gently stirring with the thick wire. Defibrination should be complete in about 5 minutes. The wire with the clot is then removed and the blood is poured into several smaller sterile tubes (about 1-inch column of blood in each). A rubber cap is placed over the cotton wool plugs to prevent evaporation and the tubes are then transferred (standing upright) to an incubator at a temperature of 37° to 41° C. The corpuscles settle in a short time, leaving about half an inch of clear serum at the top. It is apparently unnecessary to remove the leucocytes by centrifugalisation."

In addition to what is stated in the summary the following points may be noted:—

(i) There would appear to be no need to destroy the complement in the serum as is indeed indicated in paragraph number two of the summary.

(ii) The previous administration of quinine may not only influence the rate of growth of the parasites but may inhibit the growth entirely.

(iii) Under very suitable conditions *P. falciparum* can be cultivated in the original test tube through four complete generations without the medium being in any way renewed. This is illustrated by an excellent coloured plate and it is noteworthy that in the later segmentations there were never so many spores produced as in the first, where 32 were found. The authors think that this is easily explained by the conditions in the culture tube becoming gradually more adverse to growth and development.

(iv) There is nothing to show that the actual penetration of a red cell by a merozoite was witnessed.

(v) The authors think that the discrepancies in the accounts of the number of spores found in *P. falciparum* in the human host are due either to the observation of autopsy smears being made at a time when sporulation had not reached its maximum or being conducted on cases where quinine had been given before death.

(vi) As regards the cultivation of *P. vivax* it is important to draw the blood from the patient when the young forms predominate, so that it is then certain that what is seen in the tubes is undoubtedly a further development of the parasite.

(vii) The recent teaching of Ross on segmentation is quoted. It has in part been confirmed by this work and is to the effect that in the case of the benign tertian parasite there are four splits, *i.e.*, 16 spores, with the quartan parasite three splits, *i.e.*, 8 spores and with the malignant parasite five splits, *i.e.*, 32 spores.

[While, as stated, the coloured illustrations are well executed, it must be admitted that Figs. 13, 15, and 17, illustrating young intracorpuscular parasites of the new generations, are not wholly convincing. No fault can be found with the ring form shown in Fig. 20, but, in the light of Schilling-Torgau's recent work, the other forms illustrated might not be parasites.]

Bass (Charles C.) & Johns (Foster M.). **Cultivation of Malarial Plasmodia (*Plasmodium falciparum*) *in vitro* in the Blood of a Diabetic without the Addition of Dextrose.**—*Amer. Jl. Trop. Dis. & Preventive Med.* 1913. September. Vol. 1. No. 3. pp. 246-249.

In a previous paper (see this *Bulletin* Vol. 7, pp. 22-24) the authors pointed out that in order to cultivate the asexual cycle of the malarial plasmodium *in vitro*, dextrose had to be added to the culture medium. They now mention the case of a diabetic (illness of three years' standing) who had malaria for seventeen days and had been taking quinine irregularly since the first day of fever. In the blood of the patient, without the addition of dextrose, they were able to cultivate *P. falciparum* without difficulty. Controls with non-diabetic blood showed no growth and speedy death of the parasites save, sometimes, in cases when the blood was drawn after a heavy carbohydrate meal, or following violent exertion, conditions which increase its dextrose content. It is possible that any such increase may favour the growth of malarial plasmodia *in vivo*. This could not be determined in the diabetic case as quinine had been taken. At the same time it is perhaps

noteworthy that the fever and the parasites persisted although sufficient quinine had been taken to control an ordinary case of malaria. The clinical history of the patient is given in detail.

A. B.

Zschucke (Hans). **Ueber den Ausfall der Müller-Brendel'schen Modifikation der Wassermann'schen Reaktion bei Malaria.** — *Berlin Klin. Wochenschr.* 1913. Sept. 15. Vol. 50. No. 37. pp. 1716-1719.

The fact that a certain proportion of cases of malaria give a positive Wassermann reaction led the author to apply the Müller-Brendel modification of the test to a series of seventeen cases, of which seven were benign tertian, six tropical, one quartan, and three, clinically and otherwise, cases of malaria but without parasites in the peripheral blood. Zschucke modified the very delicate Müller-Brendel method by employing a new control as recommended by Plaut.

Cases exhibiting partial or delayed haemolysis as well as those in which it was complete were admitted as positives. Out of seventeen cases only three were negative, *i.e.*, a case of benign tertian, a case of chronic tropical malaria and a case of chronic malaria showing no parasites in the blood. In seven of seventeen cases da Rocha-Lima applied the ordinary Wassermann test. Of these no less than six were negative, the single positive case being one with rheumatic complications in which the positive result changed later to a negative reaction.

This tendency towards a weakening and final disappearance of the reaction which is characteristic of the ordinary Wassermann test in malaria is also found with the Müller-Brendel modification. The author discusses this peculiarity and considers fully the various factors which may play a part in bringing it about and also in influencing the occurrence of the test itself. It seems evident that one is much more likely to get a positive result with the Müller-Brendel modification in malaria than with the original Wassermann method. A record of the cases and the results obtained, arranged in tabular form, completes an interesting paper, chiefly however of value to the laboratory worker.

A. B.

de Haan (J.). **Ueber das Vorkommen der Wassermannschen Reaktion bei akuten Malariakrankheiten in den Tropen.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1913. Oct. Vol. 17. No. 20. pp. 693-705.

This is the record of a very carefully conducted research. The author enters fully into the literature of the subject and shows that the results hitherto obtained by different authors are not sufficiently in accord to render his research superfluous. The latter was conducted in Java and the blood sera of 163 cases of acute malaria were tested with respect to the presence or absence of a positive Wassermann reaction.

A great difficulty in any such investigation is, of course, the possible presence of a latent syphilitic infection in a malarial patient. In the Tropics the question of yaws has also to be considered.

Of the 163 patients examined 41 were Europeans, 117 Javanese, 3 Chinese, 1 Japanese and 1 Cingalese. In every case the diagnosis of malaria was confirmed by blood examination and the species of the parasite present noted. Further, so far as possible, an accurate enquiry was made into the possibility of previous or concurrent syphilitic infection. Thus, in each case, not only was the venereal history the subject of close enquiry but an examination of the genitalia for scars was made and a search conducted for enlarged lymph glands. Yaws was excluded. The question raised by Jaworski and Lapinski as to the possibility of the presence of quinine in the blood being a cause of a positive Wassermann reaction was kept in mind and all patients were asked if they had taken quinine recently.

The author's statistics are interesting. Of the 163 cases 61 were benign tertian, 9 quartan, 88 tropical (sub-tertian) and 5 mixed (benign tertian and tropical).

The Wassermann reaction was positive in 63 cases, a percentage of 38·6. It was obtained in 20 tertian cases, 5 quartan, 37 tropical and 1 case of mixed infection. A negative result was forthcoming in 95 instances. In the case of 5 Javanese the serum was found to have strong inhibiting properties.

The positive result was found in 5 Europeans, 51 Javanese, 2 Chinese, 1 Japanese and 1 Cingalese.

De Haan points out how different his results are to those of Blasi who, in Italy, obtained a positive result in 51·6 per cent. of the cases he examined. Blasi's results also differed as regards the reaction in the various kinds of malarial infection.

De Haan thinks that possibly Blasi did not sufficiently exclude previous syphilitic infection. He gives some interesting details as to the information furnished by his own search for evidence of syphilitic infection and in this connection he also instituted enquiries as to other venereal diseases from which his patients might have suffered. Twenty-seven persons were proved to have had venereal trouble. Of these 16 showed scars on the penis but only 8 of the latter gave a positive Wassermann reaction. After excluding every doubtful case de Haan yet found 10 patients in whom the test was positive; out of the 63 positive cases only 12 had taken quinine shortly before their blood was tested. In a praiseworthy endeavour to be yet more certain as regards his results and conclusions the author continued his observations on 30 of the 63 positive cases. He treated them with quinine and after varying periods again subjected them to the Wassermann test. In 11 of the cases a previously positive reaction became negative, apparently as the result of the treatment and amongst these 11 cases all three forms of malaria were represented. The time at which the change takes place seems to vary and perhaps if the investigations had been continued on the 19 cases which remained positive these might also have exhibited the alteration. At any rate the author has conclusively shown that in several persons suffering from one or other form of acute malaria a positive Wassermann reaction was present which was due to the malarial infection. After quinine treatment the reaction became negative but changed again to positive when relapses occurred.

He says that it is not yet clear why all cases of acute malaria do not give a positive reaction but advances the hypothesis that, as the action is in part at least a lipoid one, some malarial infections may cause such changes that a lipoid reaction is present in the blood serum whereas others have not this effect. A lengthy table, embodying the result of this careful research, concludes the paper.

A. B.

Brown (Wade H.). **The Renal Complications of Hematin Intoxication and their Relation to Malaria.**—*Arch. Internal Med.* 1913. Sept. 15. Vol. 12. No. 3. pp. 315-321.

The author having considered the blood changes produced by alkaline hematin [see this *Bulletin*, Vol. 2, p. 341] now discusses the renal complications of hematin intoxication. This has been studied in rabbits, the hematin and hematin solutions being the same as those used in former experiments. The effects on the urine and on the kidneys are considered separately. The author states that—

"It is not possible to correlate closely the renal complications of hematin intoxication with those of human malaria. The disturbances of function and the lesions of the kidneys have been found much more pronounced in hematin intoxications than in comparable grades of malarial infection in man, while the predominance of the glomerular lesions observed in these experiments is not found in malaria. These differences are partly due to the difference in the concentration of hematin in the blood. It is believed, however, that the analogy is sufficiently close to render the facts disclosed by these experiments of value as a basis for a clearer comprehension of the mode of production of the renal complications of human malaria."

The following is the summary of the work accomplished:—

"1. Mild grades of hematin intoxication produce degenerative lesions in the kidneys and the urine shows a trace of albumin and casts.

"2. Severe grades of hematin intoxication result in extensive dilatation, injury and occlusion of the renal vessels by hyalin thrombi or emboli, all of which are most pronounced in the glomerular vessels. Extensive degeneration and necrosis of tubular epithelium, hemorrhages and even anemic infarcts result from these vascular lesions. In such cases, the urine presents the characteristics of an acute nephritis.

"3. In rare instances of severe hematin intoxication, hemoglobinuria may occur.

"4. During the period of recovery from acute hematin poisoning and in chronic poisoning, the kidneys show both degenerative and proliferative processes. The glomerular tufts shrink and the capsular space and tubules are more widely dilated. The tubular epithelium shows degeneration and active regeneration with abundant mitotic figures. There are foci of round-cell infiltration and of connective tissue increase. There is also a slight diffuse increase in connective tissue. The urine is increased in amount and contains albumin with hyaline and granular casts.

"5. The renal complications of hematin intoxication are believed to be due primarily to dilatation, injury and occlusion of renal vessels under the action of hematin."

It will be seen that no light is thrown on the problem of haemoglobinuria though in a small percentage of cases it has been produced by intravenous injection of hematin.

A. B.

Zoia (L.). **Studi sulla Malaria. Sul Potere Emolitico dello Siero e dei Globuli Rossi e sulla Prova di Bordet e Gengou nella Malaria.** [On the Haemolytic Power of the Serum and the Red Blood Corpuscles, and on the Bordet-Gengou Reaction in Malaria.]—*Malaria e Malat. d. Paesi Caldi.* 1913. June-July. Vol. 4. No. 4. pp. 233-239.

This is a laboratory paper. The author finds that the blood of persons who have suffered from malaria acquires a specific haemolytic power towards the red corpuscles of persons suffering from malaria, provided that they contain plenty of parasites. The demonstration is facilitated by a preliminary treatment of the serum by Rossi's method, which consists in placing the serum for half an hour at a temperature of freezing in contact with washed erythrocytes of the sheep; the serum is then centrifuged and used for the haemolytic test. Control experiments show that this power is not possessed by the serum of patients suffering from other diseases. The test consequently possesses some value as an indicator of latent malarial infection. Three pages of tables are given showing details.

A. B.

Prevention.

Bass (C. C.). **Eradication of Malaria.**—*Interstate Med. Jl.* 1913. Oct. Vol. 20. No. 10. pp. 921-926.

The author points out how serious a disease is malaria in the southern portion of the United States. It takes toll of thousands of lives annually and, in addition, incapacitates great numbers of workers for days or weeks. Indeed he thinks that it is perhaps the most common and important disease met with in practice amongst southern communities. He believes its almost complete eradication is only a question of the necessary funds, concerted action and education, both lay and professional. Once the importance of a great anti-malarial campaign was fully recognised it is certain that sufficient money for its prosecution would be forthcoming from wealthy philanthropists and other sources. Education through the medium of the public schools is required and also through the press of the country and the agency of corporations and employers of labour, such as rail-road companies, plantation managers, &c. More thorough instruction in the case of medical practitioners is required and Bass outlines a scheme for the co-operation of medical schools in malarial districts.

He remarks that:—

"6. A point of very great importance brought out by Dr. Thayer, of the Johns Hopkins Medical School, was that if the mosquito is exposed for any considerable length of time to a temperature below 65° F., plasmodia fail to develop in her and those that have developed die. The season during which the temperature does not drop below 65° F. at any time in the Southern States varies in the different sections. It may be safely stated, therefore, that the length of time during which mosquitoes may serve as hosts for malarial plasmodia does not exceed four to six months, except perhaps in the extreme southern part of the United States.

"7. During the other six to eight months malarial plasmodia are kept alive in human hosts, malaria carriers. These are usually those persons

who have had malaria in some form during the previous warm season. The plasmodia may give rise to active symptoms of malaria or no symptoms may occur, especially during the cool season."

Passing to the questions of prevention and treatment the author points out that until the sexual forms appear in the blood, usually about two weeks after infection has occurred, the patient is not a source of infection to others. Hence early, thorough and successful treatment is all important.

"12. Though quinine will probably not kill sexual malarial plasmodia. it will kill the young plasmodia which they produce, resulting in relapse. Since their life is not more than six weeks, it is only necessary to take quinine properly for this length of time to prevent the development of new plasmodia from them and to allow all the old ones to die out. Unless quinine is taken for this length of time the case is likely to relapse and to be a source of infection to others through the agency of mosquitoes.

"All that is required for the complete eradication of malaria is for everybody who had malaria during a warm season to take the proper amount of quinine on each of two consecutive days in each of six consecutive weeks during the following cool season.

"If this statement could be brought with sufficient authority to the attention of all the people, and if the importance of everybody's co-operating could be emphasized, the writer's belief is that a vast majority of the malaria carriers would follow the advice given."

Two serious obstacles would present themselves in the course of the effort to eradicate the disease along educational lines.

(1) Carelessness of, or disregard of advice by, a few infected persons. For these Bass suggests compulsory segregation as in small-pox, &c.

(2) Importation of cases from abroad. It is possible that some kind of quarantine restrictions may yet be necessary, but a more efficient method would be to carry the education propaganda to the countries providing the infected immigrants.

A. B.

Shaver (P. J.). **Eradication of Malaria.**—*Texas State Jl. of Med.* 1913. Sept. Vol. 9. No. 5. pp. 161-163.

A general paper containing nothing new. The author, however, quotes the evidence of Dr. Evans of Chicago before the Drainage Congress to the effect that the extinction of the mosquito would add ten dollars to the value of every acre of land in the malarial infected Southern States of America and would double the crops.

A. B.

Hudleston (W. E.). **An Analysis of our Present Position with Regard to the Prevention and Cure of Malarial Infections.**—*Jl. R. Army Med. Corps.* 1913. Sept. Vol. 21. No. 3. pp. 320-338.

After a fairly complete summary of our present knowledge of malaria, more especially as regards prevention and cure, and after a consideration of malaria carriers, the problem of latency, and the occurrence of quinine-resistant strains of the parasite, the author deals with the application of this knowledge to the case of Indian cantonments. In the first place he considers anti-mosquito measures, points out how discouraging have been the results of campaigns in India, and attributes their comparative failure to the peculiar topographical and climatic conditions existing there and to the inadequacy of the funds available. He makes

a suggestion for the thorough testing of this method of control on a small scale, but concludes that anti-mosquito measures alone cannot be expected to protect the population of the average Indian cantonment from malarial infection. He is also of opinion that the efficient use of the mosquito net by soldiers in the aggregate will never, and can never, be attained, and that other methods of mechanical protection cannot be properly carried out. He thinks that everyone with experience will admit that, in India, quinine has failed lamentably both as a prophylactic and as a curative agent and attributes this failure to a lack of proper investigation of its therapeutical action. [According to other evidence it is quite as much due to professional and lay ignorance as regards the proper use of the drug. See paper by Bentley in this *Bulletin*, Vol. 2, p. 333.] He suggests the following as profitable lines of research: —

"1. The rate of absorption of the various chemical compounds of quinine in common use.

"2. The chemical condition in which these compounds reach the blood, and the method of their excretion.

"3. The effect of quinine on (*a*) the blood serum, (*b*) the red blood cells, and (*c*) the phagocytes."

In this connection he states that quinine may possibly interfere with phagocytosis and that its effect on opsonic phagocytosis and spontaneous phagocytosis should be tested. He thinks that if ingestion of quinine is found adversely to affect the opsonic power of the blood on bacteria we might justifiably infer a similar effect as regards the malarial parasite.

The author is in accord with James when he says that comparatively small doses of quinine taken over long periods may tend to produce a quinine-resistant strain of parasite. Referring to the culture work of Bass and Foster he considers that it would be interesting to test the results of injections of sub-cultures into the uninfected human being, as he thinks that if infection could thus be produced it would suggest that the sexual forms are forthcoming only when the asexual parasites are threatened with extinction. He also raises the question of the manufacture of a protective vaccine from sub-cultures.

[The author and others interested will find useful information in some of the more recent Italian and German papers on the pharmacology of quinine; notably that by Celli giving an account of the work of Gaglio and his pupils and that by Justi on quinine administration. See this *Bulletin*, Vol. 2, p. 324 and 330, also the papers by MacGilchrist reviewed in this number.]

A. B.

Unterberger (S.). **Ueber Malariabekämpfung.** (Nach den Vorträgen auf dem Washingtoner internationalen Hygiene-Kongress im Jahre 1912). [The Control of Malaria.]— *Petersburg. Med. Zeitschr.* 1913. Sept. 15 (28). Vol. 38. No. 18. pp. 221-222.

The author passes in review recent developments in the prevention of malaria, considering more especially the methods of

quinine prophylaxis and mosquito reduction. He deals with the work accomplished in the Canal Zone, Panama, and explains what is to be seen and learned both at the Seamen's Hospital and the *Institut für Schiffs- und Tropenkrankheiten* in Hamburg. He also pays a tribute to the pioneer work of Manson and Ross. He contrasts the conditions in Italy and Russia at the present time as regards the distribution of quinine. In Italy with 30,000,000 inhabitants 48,000 kilos of quinine are consumed annually; Russia with its 150,000,000 of people only uses a similar quantity. In Russia over 3,000,000 people suffer annually from malaria. It accounts for nearly half the cases of sickness in the Caucasus and the region of the Black Sea and leads to an extinction of the race. This is brought about by the resulting sterility and the frequency of abortion. The author also attributes to its baleful influence arrested or abnormal bodily development as evidenced by the presence of dwarfs, malformed skulls and faulty genitalia. As a result the percentage of recruits for the army is low in the fever-stricken districts. He mentions the presence of mixed forms of malaria and points out that while salvarsan is valuable in benign tertian infection it fails in the other forms. Finally he puts forward a plea for an energetic anti-malaria campaign in Russia, along the two main lines which elsewhere have yielded such excellent results, *i.e.*, quinine prophylaxis and mosquito destruction.

A. B.

Horowitz (Josef). **Bodenassanierung zur Bekämpfung der Malaria in Dalmatien.** [Land Sanitation in the Control of Malaria in Dalmatia.] — *Oesterreichische Sanitätswesen.* 1913. Oct. 2. Vol. 25. No. 40. pp. 1345-1350.

After some geological and historical notes by way of introduction the author explains the conditions favouring the prevalence of malaria in Dalmatia. There is much swamp; there are rivers, fed by mountain streams which overflow their banks; there is low-lying land apt to be flooded; there are lakes which form at certain seasons of the year and then dry up leaving desert stretches covered with rotting vegetation. Within the last ten years suitable engineering works costing large sums of money have effected great improvements both in reclaiming land for cultivation and in diminishing the incidence of malaria. Much, however, still remains to be done. The author describes the different kinds of operations required to meet various local conditions. Harbours on the coast have been improved, as at Nona where also the river Ricina has been controlled. Good results have been obtained in this way. The drainage of extensive swamps is an important problem as is the filling up and reclamation of low-lying lands. The mountainous nature of part of the country renders sanitary engineering costly and difficult.

It is sometimes necessary to drive long galleries through the hills to improve drainage and regulate mountain streams, and in certain places canalisation on an extensive scale is a feature of the work.

[The paper does not possess much of general interest but is useful as showing how large engineering schemes can be made to aid the hygienist and as indicating the great difficulties of anti-malarial work in a rugged and backward country like Dalmatia.]

A. B.

Straits Settlements. **Return of Malarial Fever, Blackwater Fever, Yellow Fever, Filariasis, and Dengue during the year from 1st January to 31st December, 1912.** [Ellis (Whitmore).] Received in Colonial Office 7 June, 1913.

During the year 1912 out of a population of 728,635 in the Straits Settlements there were 28,422 registered deaths. Of these 4,303 were attributed to malaria while in addition 4,194 deaths were returned as due to "fever." Blackwater fever caused two deaths.

A report by Finlayson on the anti-malarial work possesses some points of general interest. Thus in a shallow, silted-up ditch, draining a swamp near Singapore and overgrown with aquatic vegetation, the larvae of *N. rossi* and *M. sinensis* were found in enormous numbers although three types of larvivorous fish were present in abundance. These were *Haplochilus panchax*, *Hemirhamphus fluviatilia*, and *Ophiocephalus striatus*. Again, there is a note to the effect that Watson thinks that as *M. sinensis* is a feeble carrier of infection it is probable that *N. karwari* or *N. maculatus* vel *willmori* is responsible for the greater number of endemic cases of malaria. Sometimes when engineering works are being conducted even for anti-malarial purposes springs are laid bare and a flow of water is established which it is difficult to abolish. The only way of dealing with such a condition is to lay a drain of some kind. Any such drain tends to silt up quickly but it is better to lay these drains in any case, and when necessary, dig them up, clean them and reconstruct them.

Some experimental work with Anophelines has been conducted. Imagines of *N. rossi* bred out from larvae were fed on patients showing crescents and a few examined with negative results from the sixth day onwards. The majority rapidly died in captivity. A similar result was obtained in the case of *N. maculatus* and *N. ludlowi*. A few *M. sinensis* survived till the tenth day but showed no zygotes. Neither did some adult *N. rossi* captured in the Telok Blangah area.

A. B.

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. *Plasmodium cephalophi*, **sp. nov.**—*Proc. Roy. Soc.* Series B. 1913. Oct. 1. Vol. B 87. No. B 592. pp. 45-47. With 2 coloured plates.

Malaria of antelopes has not hitherto been described; hence the discovery of a plasmodium in the blood of two young duikers (*Cephalophus grimmi*) is of considerable interest. Both animals were in captivity and it was thus possible to trace the development of the parasites. Some of the various stages are illustrated in coloured drawings by Lady Bruce. One antelope suffered from

an acute attack of fever—coat staring, nose hot and dry—a few weeks after capture and after being placed in the same enclosure with the other duiker which was about three months old when brought to the station at Kasu Hill (Nyasaland). Some weeks after being taken captive a few parasites were found in the latter's blood and it is probable that it was infected in the wild state and that the duiker showing the acute attack became infected from being brought in contact with it. Both antelopes were first found infected during the height of the dry season (October) and despite a systematic search for adult and larval mosquitoes and the use of traps none of these insects could be found in or near the antelope enclosure. A young reedbuck and a young hartebeest in the same compound remained uninfected. The parasite for which, if it proves a new species, the name of *Plasmodium cephalophi* sp. nov. is suggested, is rather like the human quartan parasite, the gametocytes being circular and the schizonts having from eight to twelve merozoites. Moreover the amoeboid movement is sluggish. It differs however in the marked enlargement and pallor of the red cells and in the fact that the pigment which is pale yellow in colour is collected in a single mass. The pigment is the outcome of an intense and very characteristic concentration of a portion of the affected red cells in the food vacuole of the trophozoite, a point well brought out in the coloured plate. This appearance, together with the absence of Schüffner's dots, the dense blue staining (Giemsa) of the protoplasm of the parasite and the changes in the host cell constitute a unique aspect. Another noteworthy point is the great size of the parasites. Some of the free merozoites measure 4 by 3·5 microns, the exact size of a normal red cell of the antelope, and a full grown schizont before segmentation measures 10 by 10 microns.

Pseudopodia have been seen and also scars in the infected red cells recalling the formation of Maurer's dots. The gametocytes show numerous deeply staining chromatin granules in addition to a faintly stained nucleus. These recall those found in the Haemoflagellata and in this connection the authors state that one duiker was naturally infected with a non-pathogenic trypanosome. The macrogametocytes, well illustrated in one of the plates, are the most persistent forms and, but for the presence of pigment, might be mistaken for faintly stained leucocytes. Some curious anomalous forms of the parasite are also figured.

A. B.

Parham (F. W.). **Quinin and Tetanus.** — *New Orleans Med. & Surg. Jl.* 1913. Oct. Vol. 66. No. 4. pp. 302-309.

An account of a fatal case of tetanus following the hypodermic use of quinine. It occurred twelve years ago but the source of infection remained a mystery. The author considers that the problem has been solved by Semple's experimental work in India. He thinks the patient was probably a tetanus " carrier " and that the quinine injections, which produced small areas of necrosis, provided conditions suitable for the local development of tetanus spores into toxin-producing bacilli. These latent spores, as Semple believes, may have been conveyed by leucocytes to the

favourable nidus either from the patient's ailmentary tract through an abrasion of the mucous membrane or from the site of some old wound.

[There is nothing new in the paper which is chiefly a review of some of the literature on the subject.]

A. B.

Bireaud. **Idiosyncrasie Quinique caractérisée par des Hémorragies Multiples et Variées.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. p. 454.

A curious case at Hanoi in which quinine idiosyncrasy showed itself by causing haemorrhages from the larynx, gums and tongue. At no time was there any haematuria. The haemorrhages came on about two hours after quinine was taken and also followed a dose given by injection. They ceased when the quinine was stopped and indeed led to the quinine treatment being altogether abandoned.

A. B.

Malay States. **Report from the Institute for Medical Research for the Period October 1st, 1912, to March 31st, 1913.** [Fraser (H.), Director, Institute for Medical Research, Federated Malay States.] Received in Colonial Office June 30, 1913.

Of late years there has been an increase in the number of cases of blackwater fever in the Malay States and a determined effort is now being made to investigate the disease. Short notes on on some of the cases encountered are given and it is noteworthy that a considerable proportion of the cases diagnosed clinically as blackwater are in reality not examples of that condition. Stanton furnishes information regarding the Malayan anophelines. He has found that, when they leave the eggs, anopheles larvae of whatever species are very much alike, at least in those features commonly supposed to exhibit constant, specific differences. It is only in the later stages that their distinctive characters are developed. Further the form and arrangement of the clypeal hairs of anopheles larvae vary at the different stages of the larva's life. These changes are described for the larva of *A. albirostris* but apply equally to the larvae of all the six species specially studied. Tables are given showing the principal distinctive characters both of female Malayan anopheles and of their mature larvae.

A. B.

BLACKWATER FEVER.

MacGilchrist (A. C.). **The Haemolytic Action of Quinine and its Salts, with Suggestions regarding the Etiology and Treatment of Blackwater Fever.**—i. *Proceedings of the Third Meeting of the General Malaria Committee held at Madras, Nov.* 18, 19, & 20, 1912. pp. 16-17. (1913. Simla: Govt. Central Branch Press.) ii. *Indian Jl. Med. Research.* 1913. July. Vol. 1. No. 1. pp. 119-166. With text-figs and 9 charts.

i. The author deals in the first place with the haemolytic action of quinine and its salts. He gives a list of all the quinine salts

classified according to their haemolytic power *in vitro*. The acid salts are strongly haemolytic, for example the bi-hydrochloride, bi-sulphate &c. The neutral salts such as the sulphate, hydrochloride and valerianate are slightly haemolytic. Quinine alkaloid or base on the other hand is not only non-haemolytic but actually delays autolysis. Under normal conditions haemolysis *in vivo* by acid mixtures of quinine is prevented by the greater concentration of the medium *i.e.* the blood, the presence of serum, the neutralising effect of the blood plasma and the defensive power of the organism exercised chiefly through the liver. He suggests that in presence of an acid dyscrasia and a disordered liver this defensive power would be lost, and thinks that the hypothesis of an acid dyscrasia plus malaria and quinine explains the incidence and geographical distribution of blackwater fever better than any other theory which has been advanced. This view was strongly criticised in a discussion which followed, but for the arguments advanced against it and the author's reply thereto the original publication must be consulted.

MacGilchrist believes in giving quinine in blackwater so long as it is safeguarded by the administration of an alkali.

ii. This is a somewhat extended edition of the paper just reviewed, the author entering more fully into his subject. For example, the literature on the haemolytic action of quinine is considered as is that on the nature and structure of red blood corpuscles, especially as regards the bio-chemical and bio-physical conditions affecting haemolysis. After a reference to the chemistry of quinine where it is stated that its graphic, structural or constitutional formula is not yet definitely settled, the author gives a full account of his experiments on quinine haemolysis both *in vitro* and *in vivo*. His *in vitro* experiments also included investigations into the alleged haemolytic activity of antipyrin which is so often given along with quinine. He found that it had no haemolytic action and indeed considerably delayed autolysis, thus supporting the later views of Kobert as expressed in his article on blood-poisons in his text-book on "Intoxications." The supposed anti-haemolytic properties of calcium chloride are shown to be no greater than those of sodium chloride, at least as regards protection against haemolysis by quinine bi-hydrochloride. The *in vivo* experiments were performed upon rabbits, intravenous injections of a combination of quinine sulphate and tartaric acid being employed, a mixture which doubtless contains an acid salt of quinine. The note in the preceding review indicates the conclusions at which the author arrived.

In this second paper he considers the various forms of haemolysis which are now recognised. Thus there is chemical haemolysis (dissolution of the membrane of the red cell) as brought about by the action of acid salts of quinine; and physical haemolysis rendering the membrane permeable to haemoglobin as seen in the action of neutral salts of quinine and in autolysis. These are the true forms of haemolysis described by Mott. In addition there is haemolysis caused by changes in osmotic tension where a rent may take place in the corpuscular membrane and that produced by strong solutions of phosphoric acid. The latter seems to be an exaggerated physical haemolysis.

The section on blackwater fever has also been somewhat expanded but the author's final views, both on this subject and on quinine haemolysis generally, are perhaps best indicated by his summary which is as follows:—

"1. *Acid* salts of quinine, *e.g.*, bihydrochloride (Q. 2 HCl) and bisulphate (Q. H_2SO_4), and double salts of quinine, *e.g.*, quinine-urea chloride (Q. HCl CON_2H_4 HCl) are powerful haemolytic agents. *Neutral* salts of quinine are only slightly haemolytic, except arsenite and phosphate which have no deleterious action on the blood and arsenate which like *quinine alkaloid* itself seems to protect the red blood corpuscles and delays autolysis.

"2. A large part of the quinine administered to a man undergoes cleavage in the body and certain derivatives of quinine are known to be strongly haemolytic.

"3. It is generally acknowledged that quinine under certain conditions is capable of precipitating an attack of black-water fever. If, therefore, quinine as such (in contradistinction to a cleavage product) is responsible for an attack of black-water fever, the quinine circulating in the blood is in the form of an acid salt or a double* salt resembling in constitution quinine-urea chloride.

"4. The results obtained in my experiments on the haemolytic action of quinine and its salts are very suggestive of the existence of a diminished alkalinity of the blood in black-water fever.

"5. This hypothesis of an acid dyscrasia as the third factor (with malaria and quinine) in the causation of black-water fever receives weighty support from an examination of (1) the prophylactic and thereapeutic measures advocated in black-water fever, (2) the geographical distribution and seasonal incidence of this disease, (3) the general circumstances under which a person becomes liable to an attack of black-water fever (period of residence, diet, &c.), and (4) the symptoms and signs of black-water fever.

"6. If examination of the blood and urine of black-water fever patients proves the existence of 'acidaemia,' the prophylaxis and treatment of this condition is a simple matter. The action of quinine, like that of salicylates, should be guarded against by the administration of alkalies in all cases where an attack of black-water fever is feared."

A. Balfour.

Richter (Geo.). **The Etiology of "Blackwater Fever."**—*Med. Record.* 1913. Aug. 16. Vol. 84. No. 7. p. 297.

Material derived from the decomposition of "aged" erythrocytes (probably destroyed in the spleen) is converted in the liver into bile pigments. The action of bacteria in the intestines changes these into urobilin (stercobilin) which is in parts reabsorbed and through the portal circulation enters the liver, to be again transformed into bile pigments. These, therefore, have a double source of origin, *i.e.* haemoglobin from the circulating blood and urobilin from the portal circulation. An excess of material from either source or impaired liver function will accordingly lead to urobilinuria. Parenchymatous hepatic diseases may easily remain occult until increased work is thrown on the liver. In malaria the red cells are destroyed by the plasmodia and, as long as the latter are present in the body, there is urobilinuria even when the plasmodia cannot be demonstrated in the peripheral blood.

* "Quinine sulphate is five or six times as soluble in water as is quinine carbonate, but is much more soluble in aerated water than in ordinary water. If quinine circulates in the blood as a double salt, the acid radical of that salt is probably carbonic acid."

Other causes of urobilinuria being excluded, the presence of urobilin means the presence of plasmodia. Indeed no case of malaria can be said to be cured unless urobilin is continuously absent from the urine.

Having pointed out these facts the author concludes that "A coincidence of insufficiency of the liver, perhaps heretofore occult and also due to malarial infection, of malarial blood and eventually of the toxic effect of quinine by its inhibitory effect upon enzymes (bile forming), will have the effect that not only portal urobilin is not converted into the pigments, but that the free haemoglobin in the plasma (derived from destroyed red corpuscles) is not transformed in the liver, but arrives in the kidneys, giving rise to hemoglobinuria, that is to say, blackwater fever."

A case is mentioned where a patient, convalescent from tropical malaria, exhibited not only an enormous amount of urobilin in the urine, but also, after precipitating the urobilin, a very large amount of haemoglobin, though the urine when passed had a normal colour. The blood showed no parasites but both liver and spleen were much enlarged and very tender on pressure.

A. B.

Boye. **Fièvre Bilieuse Hémoglobinurique, Essai de Traitement par le Sérum Antivenimeux.**—*Ann. d'Hyg. et Méd. Colon.* 1913. Apr.-May-June. Vol. 16. No. 2. pp. 447-449.

The author was led to test the efficiency of the anti-venin of Calmette in a case of blackwater fever in French Indo-China, owing to the fact that such serum contains anti-haemolytic properties as shown by its action *in vitro*. The case is described at some length and during its course the resistance of the patient's red blood corpuscles to hypotonic salt solution was estimated from time to time. Unfortunately this was not done before the serum injections were commenced, but the latter certainly seemed to increase the resisting power of the patient's erythrocytes.

The dose of the serum was 10 cc. intravenously and the same quantity subcutaneously. It was given the day following the appearances of blackwater symptoms *i.e.* July 27th. A quinine injection was given shortly afterwards. An improvement resulted, especially as regards the quantity and colour of the urine voided, but on July 28th the patient's general state necessitated giving him a hypodermic of isotonic salt solution and caffeine. On July 29th the patient was convalescent, all vomiting having ceased and the urinary secretion being abundant and of normal colour. The author, who has had a large experience of blackwater both in tropical Africa and Tonkin, states that he has never seen the haemoglobinuria vanish so rapidly as in this case. The urine cleared gradually, exhibiting a succession of different shades of colour on its course to normal. Although no definite conclusion can be drawn from a single case the author thinks the method worthy of further trial.

A. B.

SLEEPING SICKNESS.

Rodhain (J.), Pons (C.), Vandenbranden (F.), & Bequaert (J.). **Rapport sur les Travaux de la Mission Scientifique du Katanga (Octobre 1910 à Septembre 1912).**—254 pp. With 2 coloured plates and 47 text-figs. Annexe: Carte du Katanga, Répartition des Glossines. 1913. Brussels: Hayez, Imprimeur de l'Académie Royale. [Royaume de Belgique, Ministère des Colonies.]

The first portion of the section of this report dealing with trypanosomiasis refers to the distribution and etiology of sleeping sickness along the Congo from Leopoldville to Basoko and in certain portions of the State as far as Kasongo. A summary of the results of examination of the inhabitants for sleeping sickness is given in two tables. There follows an account of the distribution and etiology of the disease in the lower Katanga district and of the prophylactic measures adopted. In the lower Katanga the existence and spread of sleeping sickness appears to be strictly bound up with the presence of *G. palpalis*. On the plateau of Biano *G. morsitans* is found as high as 1,600 metres, whilst *G. palpalis* does not extend beyond 1,140 metres. Cases of sleeping sickness found in villages 1,200 metres above the sea level are imported cases. Reference is made to the work of Roubaud, Kinghorn and Yorke, and Fischer on the influence of climatic conditions on the development of trypanosomes in Glossina. The reasons for the non-infectivity of *G. morsitans* on the upper Katanga may be considered, therefore, to be partly the special biological character of this insect and partly owing to the climatic conditions in which it lives.

The conditions of humidity and temperature necessary for the development of *T. gambiense* in *G. morsitans* certainly obtain in the lower territories north of the Katanga, and the authors succeeded in transmitting the human trypanosome by means of laboratory bred *G. morsitans*. What rôle does this tsetse play in nature in the epidemic of sleeping sickness of the lower Katanga? In the valleys of the Fungwe and the Muanza *G. palpalis* is rare in contradistinction to the gravity of the epidemic, whilst *G. morsitans* is abundant in these more humid valleys. At first the authors were of opinion that the part played by *morsitans* was not negligible, but on further studying the life of *palpalis*, they were able to prove that considerable migration of these insects occurred. As a result of their observations the authors have not been able to convince themselves that *G. morsitans* plays an active part in the transmission of sleeping sickness in the lower Katanga, its rôle in nature appears to be only secondary to that of *G. palpalis*. The explanation of this fact is to be sought in the character and mode of life of *G. morsitans* and in the nature of the virus, *T. gambiense*. *G. morsitans*, a fly of the savannah, lives especially on animals; *T. gambiense* is a parasite adapted to man who constitutes its reservoir *par excellence*. If it is proved that antelope can act as a reservoir of this virus, in nature this eventuality does not appear to be frequently realised. Although in laboratory experiments *G. morsitans* infects as readily

as *G. palpalis*, in nature the former fly only rarely has its first feed on an infected host; the second on the contrary, living by preference on human blood, feeds frequently the first time on an infected host. When it is a question of an organism like *T. rhodesiense*, which is as virulent for man as for animals, *G. morsitans* infects very readily, a considerable proportion of the animals of the savannah acting as reservoirs of the virus. Actually then, in nature, *G. morsitans* does not appear dangerous for man in the lower Katanga where the disease is occasioned by *T. gambiense*.

Regarding prophylaxis the authors state that the most important points are firstly to protect the population against the bites of infected *G. palpalis*, secondly to prevent the flies becoming infected, especially in regions still free from the disease, and thirdly to prevent the introduction of the virus of Rhodesia which could be rapidly disseminated by the numerous *morsitans* which live here in conditions favourable to the spread of the disease. These three propositions are discussed at some length.

The authors deal with the transmission of *T. gambiense* by *G. morsitans*, and with the mechanism of the transmission of trypanosomes by *Glossina*. Most of this work has been published previously (see this *Bulletin* Vol. 1, p. 266 and p. 124). By means of a simple apparatus consisting of a U shaped tube, the short limb of which was slightly enlarged and covered with a membrane consisting of the fresh skin of a mouse, the authors were able to demonstrate that *Glossina morsitans* could take up blood under a slightly negative pressure. The apparatus was filled with citrated blood in such a manner that the level of the liquid in the longer limb was 1 cm. above that of the fluid in the short limb where it was in contact with the under surface of the skin.

The first three flies placed on the membrane engorged themselves so that the height of the column of fluid in the longer limb fell to within 2 mm. of the level of the membrane. Four other tsetses fed rapidly and without the least difficulty, and after their repast the level of the fluid in the longer limb was 6 mm. below that of the membrane.

Hence it is obvious that *G. morsitans* does not require fluid under a positive pressure in order to engorge itself. The authors believe that the reason why tsetses do not feed on extravasated blood, which is not covered by a membrane, is purely mechanical, as the fly in biting is accustomed to pierce a membrane with its proboscis.

The Glossina prefer blood to the serum only, with which they will only engorge themselves when very hungry. Neutral red does not appear to damage the flies but sodium emetic, even in very dilute solutions, has a deleterious effect on their digestive functions. Fifteen flies were fed on blood containing sodium emetic (1 part to 20,000 of blood) and eleven died within four days. The blood is more readily taken if warmed to 37° C. than if offered cold. It is important to take aseptic precautions as, when the blood is contaminated with bacteria, these continue to multiply in the gut of the flies and cause death.

The second portion of the report is concerned with the trypanosomiasis of large mammals in the same district. Observations are recorded on the nature, etiology and therapy of the various trypanosomal infections of large domestic stock and game. By way of introduction the authors define briefly the names used by them; thus '*dimorphon-congolense*' refers to a parasite of the short type without free flagellum of which the narrow forms correspond to the stumpy forms of *T. dimorphon* (sensu Laveran and Mesnil) and *pecorum* of Bruce, and the broad and short forms resemble *T. congolense* of Broden or *nanum* of Balfour. These four species are closely related morphologically and if it be possible to differentiate *T. dimorphon* sensu Laveran and Mesnil from the others by means of forms as long as 20–25μ, yet it is quite impossible to distinguish morphologically *T. congolense* and *T. nanum*.* The differential character of the last two lies in the fact that the latter is non-inoculable into small laboratory animals (dog, guineapig and rat); but aflagellar trypanosomes from the dog cannot always be inoculated into the guineapig and rat, so that in Africa where an indefinite number of animals is not available the identification of parasites morphologically closely allied is often very difficult.

The trypanosome of nagana (Plimmer and Bradford) is a parasite which always has a free flagellum and corresponds in its general appearance to T. *evansi*. More recently Bruce has described the parasite which bears his name as a dimorphic parasite and as such it takes its place in the *gambiense* and *pecaudi* group. The authors designate these dimorphic flagellates as *brucei-pecaudi;* they are closely related in appearance to *gambiense,* but easily separated from this by their biological reactions.

The following is a list of trypanosomes found by the authors in various districts during their tour.

1. In the Kibombo, Kassongo and Kongolo region *T. cazalboui* and trypanosomes of the *dimorphic-congolense* type were found in domestic stock, whilst these parasites and also *T. ingens* were found in various of the antelope. Regarding the transmitting agents in this district the authors established that *cazalboui* and *congolense* were transmitted by both *G. palpalis* and *G. morsitans;* the exact rôle of *G. brevipalpis* is still uncertain. The agent responsible for the propagation of *T. ingens* is not known.

2. In the lower Katanga pathogenic trypanosomes belonging to the *dimorphon-congolense* group, *T. cazalboui* and also trypanosomes of the *brucei-pecaudi* type were found. An account of the morphology and biological reactions of each of these types is given.

A series of therapeutic experiments were undertaken on animals infected with one or other of these types of trypanosomes. A number of goats and sheep infected with trypanosomes of the *dimorphon-congolense* type were treated unsuccessfully with arsenical preparations (arsenophenylglycin and orpiment).

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* According to Bruce and his colleagues *T. nanum* is a strain of *T. pecorum* which has lost its virulence for monkey, dog, and rat by passage through the goat. A.G.B.

In another series of experiments goats and sheep were treated with sodium emetic. The animals bore well doses of ·008 gm. of the drug injected intravenously; the trypanosomes disappeared from the blood, but a relapse occurred after 8 or 10 days.

The authors succeeded in keeping two European dogs alive at Sankisia in the presence of numerous *G. morsitans* by giving sodium emetic at critical times in the course of the infection. One of the animals appeared to have reached a state of relative immunity comparable to that of the wild game. It is to be noted that these animals in contradistinction to goats and sheep were at liberty and exposed to the constant bites of *G. morsitans*. Four other dogs, of which one was native, which only received a single dose of the drug succumbed to the infection. Trypaflavin A. had hardly any action on sheep and goats infected with the trypanosome (*dimorphon-congolense*); on the other hand tryparosan proved more successful and the authors consider that this remedy is the most suitable for infection due to the *dimorphon-congolense* type of trypanosome. Administered by the mouth in doses of ·5 gm. per kilogramme of body weight given on two days tryparosan causes the trypanosomes to disappear definitely after 48 hours. This dose is well borne by dogs as well as sheep and goats. Intravenous injections of arsenophenylglycin caused only a temporary disappearance of the trypanosomes.

T. cazalboui was encountered in the blood of sheep, goats and oxen and in various antelope. This trypanosome was found to be sensitive to sodium emetic, a single intravenous injection of ·1 gm. being as a rule sufficient to cause sterilisation. Of 9 goats and 1 sheep so treated only one relapsed. Tryparosan acted equally well.

Trypanosomes of the type *brucei-pecaudi* were found in a dog, which had a double infection of this and *T. congolense*, and a goat. A single transmission experiment was conducted with 29 laboratory-bred *G. morsitans*. A single fly became infective on the 18th day and was isolated and examined. It was found to have 'infection totale' of the gut and proboscis. The intestine exhibited a permanent culture of the flagellates and in the hypopharyngeal tube of the proboscis were small trypanosomes of the salivary type; attached to the labium were large numbers of leptomonas forms. These findings are similar to those of Roubaud (see this *Bulletin* Vol. 2, p. 245). The authors lay stress on the distribution of the trypanosome in the tsetse as a point of differentiation between *T. pecaudi* and *T. brucei* (*sensu* Bruce), the latter parasite invading the salivary glands of the fly, whilst the former is limited in its distribution to the gut and proboscis.

Of the non-pathogenic trypanosomes *T. theileri* and *T. ingens* were found in antelope of this district.

3. In the upper Katanga district trypanosomes of the *brucei-pecaudi*, *congolense-dimorphon*, and *cazalboui* types were found in domestic stock. No examinations of the wild game were made.

In a later chapter of the report the authors record experiments which confirm the work of Roubaud (see *Sleeping Sickness Bulletin* Vol. 3, p. 27) and Duke (see this *Bulletin* Vol. 1, p. 271).

They found that it is impossible to produce sterilisation of the proboscis of tsetse fly infected with *T. cazalboui* by feeding the flies on an animal infected with a trypanocide (emetic of soda).

Records are also given of attempts to capture Glossina by means of smearing bird-lime (made with linseed oil) on calico and placing sheets of this on the backs of natives. The results were not very satisfactory.

The report closes with a list and account of the bloodsucking diptera encountered by the members of the Commission. An account is given of the distribution of *G. palpalis*, *G. morsitans* and *G. brevipalpis* and of the pupal habitats of the first-named. The authors did not meet with *G. pallidipes*. In one instance 21 empty pupal cases and 3 living pupae were found in very dry and deeply shaded soil accumulated between the large roots at the base of a tree trunk; from the 3 living pupae 2 *G. palpalis* and 1 *G. morsitans* were hatched. The pupae were found to be practically at the surface of the soil or very slightly buried.

W. Yorke.

Da Costa (Bernardo F. Bruto). **Sleeping Sickness in the Island of Principe. Sanitation, Statistics, Hospital Services, and Work of Official Conservancy Brigade.*** Translated by Lt.-Col. J. A. Wyllie.—90 pp. With 3 plates. 1913. London: Baillière, Tindall & Cox. [2*s*. 6*d*. net.]

The report commences with an account of the history of sleeping sickness in Principe and of the reasons why the disease continued to spread unchecked until 1911.

A medical mission was despatched to Principe in August, 1912. The island was divided into three zones, so that each doctor might work in his own zone and be in touch with the prophylactic measures carried out in each estate. The blood of men and animals was examined in order that those infected might be segregated. In a period of ten months 59 new cases of sleeping sickness were discovered in the first zone (2·8 per cent.), 17 in the second zone (2 per cent.) and 49 in the third zone (4·6 per cent.). Nearly 4,000 persons were examined. There is a strong tendency for the disease to disappear from the island, for in 1908, 23·5 per cent. of the population were infected, whilst to-day, not counting old cases, there are only 3 per cent.† The total number of persons attacked is 361, of whom 50 present every appearance of being cured.

Experiments were undertaken to ascertain the value of atoxyl on animals attacked by trypanosomes. [There seems to be considerable doubt as to the species of trypanosome concerned. In 1907-8 the authors came to the conclusion that "they must belong to one of the species *Pecaudi* or *Dimorphon*," but to-day "they consider that the parasites are probably nothing more than

* Da Costa (Bernardo F. Bruto) Trabalhos sobre a Doença do Somno. Saneamento, Estatistica, Serviços Hospitalares e Brigada Official na Ilha do Principe.—78 pp. With 3 plates and 3 folding tables. 1913. Lisbon: Typographia "A Editora Limitada."

† For the Report of the previous Commission see *Sleeping Sickness Bulletin*. Vol. 2. pp. 1–7.

different modalities of the trypanosome DUTTON-CASTELLANI."] They found that atoxyl was of no value as a prophylactic or remedy, and that it was only of use as a tonic.

An account is given of the prophylactic work done by the planters, which has resulted in a fall of mortality by 50 per cent. on some properties and on others by 70 and 80 per cent. Swamps were drained, timber felled in places where Glossina took shelter, the pigs were killed, the secondary growth of scrub jungle was cleared, the flies were caught by means of sticky stuff and the infected domestic animals were slaughtered. Sleeping sickness patients were segregated, and finally injections of atoxyl were given immediately on the bite of the fly.

In February, 1911, an 'Official Brigade' was created to aid in the campaign against sleeping sickness. At first this consisted of 40 prisoners of war, but with so small a number it was found impossible to operate profitably on waste lands and on those in native hands. The number of the brigade was increased by means of convicted *serviçaes* and more prisoners of war until it reached a strength of 150 able bodied men. In August, 1912, it was ordered that the Official Brigade should consist of 300 men, but up to now this has not been carried into effect. The author writes "We find it extraordinary that though there is a Native League here, that body should not have impressed its less intelligent members with the necessity for stamping out the sleeping sickness and thus escaping the annihilation of their race. But we only find on the part of the natives of the island a sickly fatalism. The natives instead of maintaining cleanliness, let their properties go to ruin, except for little patches which they used for the growing of manioc and millet."

The Official Brigade carried out prophylactic work along much the same lines as the planters, clearing the scrub, draining swamps and slaughtering wild pigs. It is well known that the fly takes refuge in shady places, damp and frequented by animals, chiefly pig, which allow it to settle on them in large numbers and carry it about from place to place. The animals, besides being vehicles for the fly, afford it a liberal sustenance. The author has seen as many as 30 Glossina gorged with blood, hanging on the dead body of a pig; and the headman of the brigade states that whenever a pig is shot by his men, some Glossina are to be found attached to the carcass.

The number of flies caught by the brigade was 110,691; that of pigs killed, 235; lagaias, 251; and stray dogs, 272. To this number of dogs must be added 300 killed in the town area. About 65 square kilometres of land were cleared up by the brigade.

The report closes with an account of the sanitation of the town of Sant Antonio.

W. Y.

BLANCHARD (M.). **Variations spontanées de l'Infection sanguine chez quelques Malades du Sommeil.**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 581-583.

MARTIN and DARRÉ have drawn attention to the fact that the trypanosomes do not behave in the same way in all individuals

(see this *Bulletin*, Vol. 1, p. 507). The action of atoxyl in trypanosomiasis may be comparable to that of quinine in malaria and it might suffice to prevent pullulation of the parasites if the interval between consecutive injections of the drug was less long than the cycle of evolution of the parasite. Blanchard examined the blood of four cases who had never been treated. The first three were in very bad condition, trypanosomes were present in the cerebro-spinal fluid, and there was somnolence and extreme emaciation. The fourth case was in the first stage of the disease and the diagnosis could only be made by gland puncture. The parasites were sought by centrifugation of 10 cc. of blood. The results are given in the following table:—

Date of Examinations.	Souagregou.	Sangou.	Ténégoro.	Malonga.
July 7	0			
„ 9	0			
„ 11	+			
„ 12	+++			
„ 14	+++			
„ 16	+++	+++		
„ 18	++	+++		0
„ 21	0	+	++	0
„ 23	0	+	+++	0
„ 25	++	++	+++	0
„ 28	0	++	+	0
„ 30	+	++	+	0
August 1	++	++	+++	0
„ 4	++	++	++	0
„ 6	0	+++	++	0
„ 8	0	+++	++	0
„ 11	0	+++	+++	0

\+ Trypanosomes scanty or very scanty. ++ Trypanosomes not scanty.
+++ Trypanosomes fairly numerous.

It is not possible to generalise from so few cases, but the results show how variable is the intensity of infection of the blood even in patients at the same stage of the disease.

W. Y.

Mello (Ugo). **Le *Trypanosoma gambiense* a-t-il une Affinité pour le Testicule?**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 583-588.

Reference is made to the work of Uhlenhuth and Emmerich (see this *Bulletin*, Vol. 1, p. 677) which demonstrated that in rabbits inoculated with *T. equiperdum* and *T. gambiense* multiplication of the parasites is much more advanced in the testicle than in the blood. As this fact might be of practical value in the diagnosis of sleeping sickness in man the author undertook experiments with the object of verifying the observations of Uhlenhuth and Emmerich. The strain used was the *T. gambiense* preserved in Laveran's laboratory; it had originally come from a case of sleeping sickness in Uganda. Rats, guinea-pigs and rabbits were injected with the virus intraperitoneally or subcutaneously or into the testicle.

The author found that in rats, whatever be the method of inoculation, the trypanosomes always appeared first in the blood. Only rarely parasites were found as a result of puncturing the testicle except in the case where the injection was made into the testicle. In guinea-pigs trypanosomes appeared rapidly in the testicles only in animals where the inoculation was made directly into these organs. In a monkey inoculated subcutaneously the parasites did not appear in the testicle before the blood. The experiments on rabbits were more confirmatory of Uhlenhuth and Emmerich's work, as the parasites were usually scanty in the blood and often fairly numerous in the testicles. The author, however, does not believe that this is due to a special affinity of the testicular tissue for *T. gambiense*, but simply to the fact that these organs are rendered oedematous by puncturing and that the trypanosomes multiply frequently more abundantly in serum or oedematous fluids than in the blood.

It does not appear that puncture of the testicle can be utilised for the diagnosis of sleeping sickness.

W. Y.

Fleming (A. M.). **Trypanosomiasis in Southern Rhodesia.**—*Trans. Soc. Trop. Med. & Hyg.* 1913. July. Vol. 6. No. 8. pp. 298-310. With a map.

This paper gives an account of the facts elicited as a result of the investigations undertaken by the Administration of Southern Rhodesia on the first report of the discovery of human trypanosomiasis in their territory.

G. morsitans is the only variety of tsetse found in Southern Rhodesia. The fly areas lie in the northern part of the territory, are small in extent and widely separated. Why the tsetse should be confined within these somewhat arbitrary boundaries, when topographically and climatically there are stretches of country to all appearances similar around them, is unknown. After the outbreak of rinderpest in 1896 the fly belts in Southern Rhodesia underwent an extraordinary shrinkage, whilst in many districts fly disappeared altogether. Since then the fly has in some places shewn a tendency to spread back to its old boundaries.

The scattered nature and limited extent of the fly areas reduce the danger of any serious spread of sleeping sickness in Southern Rhodesia and renders its occurrence of secondary importance, for these areas are only sparsely populated by natives and are remote from European settlements. The removal of persons from any fly infested area would not be difficult should necessity arise. An account of the disease in the Sebungwe district is given (see this *Bulletin*, Vol. 2, p. 36). The author summarises the conclusions reached as a result of this investigation as follows:—

1. That trypanosomiasis in man undoubtedly exists in the Sebungwe district.
2. That the infection is small in relation to the population.
3. That the area of infection would appear to be limited to certain villages along the banks of the Busi river.
4. That whether we are dealing with *Trypanosoma rhodesiense* or *Trypanosoma gambiense*, or some new trypanosome, is still unproved.

5. That though fly-sickness in stock has been known for many years, infection of man would appear to be of comparatively recent origin.

6. That in order to prevent the further spread of trypanosomiasis in man within this area, or the infection of adjacent fly-belts in Southern Rhodesia, the wholesale depopulation of this fly-belt is advisable.

7. That unless steps are taken to prevent the spread of the fly, it will probably, given favourable conditions, spread beyond its present boundaries.

Further work showed that the various strains of trypanosomes obtained from infected men, goats and dogs in this area were identical, and morphologically and clinically allied to *T. rhodesiense.*

The chief problems before the Administration may be said to be (1) The prevention of the spread of trypanosomiasis amongst the native population of the Sebungwe district. The most effective method of checking the disease is removal of the native population beyond the fly infested area. (2) Following depopulation there arises the second and much more complex problem as to whether an attempt should be made to exterminate the fly, or whether the country should be turned into a large game reserve, as has been done with fly areas in Zululand. The author is of opinion that in any scheme for the extermination of fly within the small fly belts of Southern Rhodesia the extermination or driving back of game should be included. He considers that if money can be found, more is to be gained by systematic deforestation from without inwards, by driving of roads through the country, and by breaking up large tracts of ground and the cultivation of sugar, cotton or other products of commercial value, and the consequent eradication of game, and the general civilisation of the country.

In conclusion the author writes that the present policy, which it has been decided to adopt for the suppression of trypanosomiasis in the Sebungwe district, is briefly: To remove all natives from this and the adjacent fly belt on the Umniata to fly free areas, which steps will check further local spread of the disease. It is proposed to withdraw the game laws for the area lying to the east of the Sengwe and west of the Umniata rivers and to throw the country open for shooting. The consequent reduction of game in this area will prove a criterion as to whether in consequence of this the borders of the fly belt can be limited, and possibly fly driven back. [The two propositions in this policy seem to be antagonistic. In any serious scheme devised to deal with the game or fly or for the 'general civilisation' of the country the native population is an essential factor. If the population be removed one of the chief enemies of the game and fly is removed; and in the absence of this enemy these will probably increase and spread. If it be desired to get rid of the game and fly it is obvious that the population must be left in the district. It is equally obvious that systematic deforestation and cultivation cannot be undertaken without the native population. Presumably the Administration consider the question to be a serious one or it would not decide upon so drastic a remedy as the evacuation of the country. Such a policy, however, can hardly be regarded as a satisfactory effort to counteract a danger. The game and fly will probably increase in the absence of man and the

mere removal of the game laws are hardly likely to produce much reduction in the quantity of game in a country devoid of native population.]

W. Y.

Brown (Alexander). **Notes of a Case of Sleeping Sickness found on the Hills, Twenty-two Miles north of Serenje, in North Rhodesia.**—*Jl. Trop. Med. & Hyg.* 1913. Oct. 1. Vol. 16. No. 19. pp. 302-303.

A clinical account of a case of sleeping sickness in a native is given. The diagnosis was made on July 22nd, 1912. There is some doubt as to where the infection was contracted. The history of the patient, a boy of 18 years, is as follows. He was born in Chimese's village (six miles from Dr. Livingstone's grave); he left his home and went to Serenje in 1908 and was employed by the assistant magistrate, whom he accompanied on at least one journey into the Luangwa Valley. In 1909 he was employed by the Mission and returned to his home as a teacher. In August, 1910, he crossed the Luangwa Valley to Nyasaland and in July, 1911, he made a journey to Broken Hill—a route on which there is no 'fly' until near Broken Hill. In the present year he has been only a few miles from Serenje and not to the author's knowledge in a 'fly' area.

The author writes that a case with such a history occurring at an altitude of 4,800 feet in a fly area calls for some attention. As regards the source of infection there are four possible explanations:—(1) That trypanosomiasis is endemic in the blood of some people. (2) That infection occurred in the Luangwa Valley where, however, he has not been since 1910. (3) That he got it when travelling around his own home in 1909. (4) That he was infected at the mission station near Serenje (20 miles from the nearest 'fly'). In that neighbourhood there are no biting flies except Stomoxys which is found in the neighbourhood of cattle kraals. As possible carriers of the infection there are, in addition to Stomoxys, bugs, ticks and cockroaches. [It appears possible that infection occurred in July, 1911, when the patient went to Broken Hill, near which place it seems likely that the case described by Ellacombe became infected (see *Sleeping Sickness Bulletin*, Vol. 4, p. 185).]

W. Y.

Research in Nyasaland.

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. **Morphology of Various Strains of the Trypanosome causing Disease in Man in Nyasaland. The Mzimba Strain.**—*Proc. Roy. Soc.* 1913. Oct. 1. Vol. B 87. No. B 592. pp. 26-35. With 3 plates and 2 charts.

It has been one of the objects of the Commission to determine whether the trypanosome causing human trypanosome disease in Nyasaland is restricted to the game and 'fly' of the Proclaimed Area, or if it extends to the north and south along the 'fly-belt.' If it is found to extend over all the 'fly area' in Nyasaland, then

the disease is probably native to the soil and not an importation from Tanganyika or the Congo. The following are the three opinions or theories at issue:—

"First that the human trypanosome disease of N.E. Rhodesia and Nyasaland is caused by a specific trypanosome, *T. rhodesiense*, that the wild game and 'fly' are heavily infected with it, and that *T. brucei* or Nagana, is absent altogether.

"Second, that the wild game and 'fly' are heavily infected throughout these 'fly-areas' by *T. brucei*, but that at certain places or foci another trypanosome, *T. rhodesiense*, occurs, which is pathogenic to man as well as the other animals. That these two species of trypanosomes are indistinguishable morphologically or by their action on animals, except that one is capable of infecting man and the other not. That the only way to separate them is by inoculating man: if the man reacts it is *T. rhodesiense*, if not, *T. brucei*.

"Third, that *T. brucei* and *T. rhodesiense* are one and the same species of trypanosome, and that wherever wild game and *G. morsitans* are found there also will be found cases of trypanosome disease in man. That the cause of the sparsity of cases in man in these areas is due to the fact that man is more or less refractory to the trypanosome, and that it is only rarely that the 'fly' meets with a susceptible subject. That this is the reason why the cases of Human trypanosome disease in the Luangwa Valley and in Nyasaland do not tend to increase in numbers. The disease remains stationary, as it probably has done during the last thousand years. This is the working hypothesis held at present by the Commission.

"These, then, are the points at issue and it would appear that the only way of solving the problem will be by searching and finding out whether cases of *T. brucei* disease, or Nagana, in man occur wherever *G. morsitans* and this parasite are found together. Already cases have been found on the Rovuma river on the borders of German and Portuguese East Africa, and in the Hartley district south of the Zambesi, in Europeans and natives, who certainly could only have contracted the disease in these widely separated districts."

The trypanosome with which this paper deals came from the blood of a donkey at Mzimba about 100 miles north of the northern border of the Proclaimed Area. A detailed account of the morphology of the parasite is given.

The following are the conclusions:—

"1. The trypanosome of the Mzimba strain is the same species as that occurring in the wild game inhabiting the Proclaimed Area, Nyasaland.

"2. It has already been concluded that this species is *T. brucei* vel *rhodesiense*.

"3. Hence it would appear that wild *G. morsitans* occurring in a district 100 miles north of the Proclaimed Area are infected with the trypanosome which causes the Human trypanosome disease of Nyasaland."

W. Y.

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. **The Trypanosome causing Disease in Man in Nyasaland. Susceptibility of Animals to the Human Strain.**—*Proc. Roy. Soc.* 1913. Oct. 1. Vol. B 87. No. B 592. pp. 35-45.

The pathogenicity of the five strains derived from cases of trypanosome disease in man in Nyasaland is compared (see this *Bulletin*, Vol. 1, p. 659). The results are given in tables.

The trypanosome is not as deadly to oxen as is *T. pecorum*. Of 13 animals inoculated only one died, after an illness lasting 134 days. Four became infected and recovered, while the remaining 8 were refractory. The disease is fatal in goats; 22 were used for experimental purposes and not one of them recovered. The

average duration of the disease was 41·8 days (19-72). One of the animals showed swelling of the face, but none developed opacity of the cornea. The duration of the disease in sheep was 41·1 days (16-87). Among the seven used, oedema of the face was noted as a prominent symptom in three. No opacity of the cornea developed in any of them. One baboon was inoculated without success. Twenty monkeys died on an average in 25·8 days (10-51). The average duration of the disease in 25 dogs was 34·3 days (14-78). In eight of these opacity of the cornea and swelling of the face were present. Seven rabbits died on an average in 27·9 days (15-42). A rabbit suffering from this disease presents exactly the same clinical picture as that seen in rabbits suffering from nagana.* There is swelling around the eyes, then the face puffs up, there is ulceration round the eyes and nose, and thickening of the ears. Towards the end the eyes are completely closed up, the nose much swollen and both eyes and nose discharge a purulent fluid. Guinea-pigs are more refractory than rabbits and often require to be re-inoculated before they take the disease; 15 were used and died on an average in 66·6 days (13-114). Twenty-one rats were inoculated and the disease lasted on an average 30·3 days (13-93).

Table VI.—The Average Duration, in Days, of the Disease in Various Animals. The letter R means that the animal is refractory, that is, not susceptible to the disease.

Strain.	Ox.	Goat and Sheep.	Baboon.	Monkey.	Dog.	Rabbit.	Guinea-pig.	White Rat.
I.	134	34	R	30	24	42	52	21
II.		59		16	32	33	95	44
III.		31		18	42		62	22
IV.		37		39	33	15	57	49
V.		60		25	42	28	102	32

The conclusions are:—

"1. The trypanosome causing disease in man in Nyasaland is fatal to goats, sheep, dogs, and the smaller laboratory animals, killing them, without exception, in a few weeks. It is less virulent to cattle, many of which evidently escape.

"2. No difference in virulence can be made out in these five Human strains.

"3. It is not satisfactorily proved yet to what species this trypanosome belongs, but the Commission at present leans to the opinion that it is *T. brucei* (Plimmer and Bradford)."

W. Y.

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. **Trypanosomes of the Domestic Animals in Nyasaland. I. *Trypanosoma simiae*, sp. nov. Part II. The Susceptibility of Various Animals to *T. simiae*.**—*Proc. Roy. Soc.* 1913. Oct. 1. Vol. B 87. No. B 592. pp. 48-57.

This paper gives an account of the pathogenicity of *T. simiae* (see *Sleeping Sickness Bulletin*, Vol. 4, p. 350). So far as is known the warthog is the only animal among the wild

* And dourine, according to published descriptions.—A. G. B.

game of the Proclaimed Area of Nyasaland which harbours it. This trypanosome is very virulent in monkeys and the domestic pig, but harmless to oxen, antelope, dogs and the smaller laboratory animals. The rapidity with which the virulence of *T. simiae* becomes modified is also remarkable. When a cage containing wild *G. morsitans* is placed on a monkey and a goat, both animals take the disease, and the monkey in such an acute form that the average duration of life is only a few days. But if it is attempted to pass *T. simiae* from an infected goat to a healthy monkey by the inoculation of goat's blood, the experiment usually fails, showing that a short sojourn in the blood of the goat has almost nullified the virulence of the parasite for the monkey. This loss of virulence is also seen in *T. pecorum*.

Although *T. simiae* somewhat resembles *T. pecorum* in general appearance the two species differ markedly in their action in animals. Details of the animal experiments are given in tables.

Table IV.—The Average Duration of Life in Various Animals infected by *T. simiae*, Nyasaland. Mixed infections are not included. The duration includes the days of incubation; it dates from the date of infection. The letter R stands for refractory.

——	Ox.	Antelope.	Goat and Sheep.	Pig.	Baboon.	Monkey.	Dog.	Rabbit.	Guinea-pig.	Rat.
Average duration in days.	R	R	46·6	5·3	R	10·8	R	R	R	R
No. of animals employed.	4	5	5	9	3	24	21	10	5	5

Table V.—The Percentages of Recoveries in Various Animals from *T. simiae* infection. This table includes mixed infections.

——	Ox.	Antelope.	Goat and Sheep.	Pig.	Baboon.	Monkey.	Dog.	Rabbit.	Guinea-pig.	Rat.
Percentages ...	R	R	37·5	0·0	R	14·3	R	R	R	R
No. of animals employed.	4	5	32	13	3	35	21	10	5	5

In Nyasaland the carrier of *T. simiae* is *G. morsitans* of which 3·4 per 1,000 were found to be infected. The host or reservoir of the parasite is the warthog. Thirty-three of these animals were examined, and *T. simiae* found in three.

The conclusions are:—

"1. *T. simiae* belongs to the same group as *T. pecorum*, and, like the latter, is erratic in its action on animals.

"2. *T. simiae* affects goats, sheep, pigs, and monkeys. Oxen, antelope, dogs, rabbits, guinea-pigs, and rats are practically immune.

"3. The carrier is *G. morsitans*.

"4. The reservoir of the virus is the warthog."

W. Y.

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. **Trypanosome Diseases of Domestic Animals in Nyasaland. I.** *Trypanosoma simiae*, **sp. nov. Part III.**—*Proc. Roy. Soc.* 1913. Oct. 1. Vol. B 87. No. B 592. pp. 58-66. With 3 plates.

This paper gives an account of the development of *T. simiae* in *Glossina morsitans*.

There is a well-marked separate and characteristic mode of development in each of the three main groups of trypanosomes. In the first group—the *T. brucei* group—which includes *T. brucei*, *T. gambiense*, *T. evansi* (?), and *T. equiperdum* (?) the parasites develop—at least in the first two named species—at first through the whole length of the intestinal tract, excluding the proboscis, and eventually reach the salivary glands, where forms resembling those found in the blood of animals are developed and these alone constitute the infective stage.

In the second group—the *T. pecorum* group—which includes *T. pecorum* and *T. simiae* the development takes place in the intestinal tract, including the labial cavity of the proboscis—afterwards the trypanosomes reach the hypopharynx, or termination of the salivary duct in the proboscis. In this group trypanosomes are never found in the salivary glands and no blood forms or infective forms are developed until the hypopharynx is reached.

In the third group—the *T. vivax* group—which includes *T. vivax*, *T. uniforme* and *T. caprae*, the initial stages of the development take place in the labial cavity of the proboscis alone; later the hypopharynx is invaded, where again blood forms are developed which again constitute the only infective forms. There is no invasion of the salivary glands and in addition no develop- takes place in the intestinal tract. [This classification should be compared with those of Duke (see this *Bulletin*, Vol. 2, p. 243) and Roubaud (*loc. cit.*, p. 245).]

A brief description of the proboscis of Glossina is given. This consists of two tubes: one—the labial cavity—for the passage inwards of blood, made up by the coalition of the labrum and labium, the other for the passage outwards of the salivary secretion—the terminal salivary duct or hypopharynx.

Eight transmission experiments were carried out with *T. simiae* and laboratory bred flies. Two were positive and six negative. There was a great difference between the two positive experiments as regards the time required for the flies to become infective. In the first, 50 days elapsed, in the second only 20. This is due to the different temperatures under which the experiments were carried out—62° F. in the case of the former experiment and 83° F. in the case of the latter. Details of the experiments are given in tables; of 173 flies used in these experiments 10 (5·8 per cent.) became infected with a growth of trypanosomes in the intestines and in the proboscis. Only one fly in 31 (2·7 per cent.) became infective when the flies were kept at ordinary room temperature 62° F., whereas four became infected in 45 (9 per cent.) when the flies were kept at a temperature of 83° F. [These observations support the views expressed by Kinghorn and Yorke in their papers on the influence of meteorological con-

ditions on the development of *T. rhodesiense* in *G. morsitans* (see this *Bulletin*, Vol. I., p. 43 and 126).]

In the two positive experiments out of 76 flies dissected nine infected flies were found. The following table gives the results of dissection of these nine flies.

Table VI.

Expt.	Time, days.	Proboscis.		Proventriculus.	Crop.	Foregut.	Midgut.	Hindgut.	Proctodæum.	Salivary glands.
		Labial cavity.	Hypopharynx							
754	37	++		++	—	++	++	—	—	—
754	50	++		++	—	++	++	—	—	—
1847	16–26	—	—	—	—	++	++	—	—	—
1847	30–40	+	+	—	—	++	++	—	—	—
1847	31–41	++	+	++	—	++	++	++	—	—
1847	31–41	++	—	+	—	++	++	++	—	—
1847	31–41	++	+	+		++	++			
1847	32–42	++	+	+	—	++	++	++	—	—
1847	32–42	—	—	+	—	++	++	—	—	—

In order to examine the contents of the hypopharynx a tube containing one of the infective flies was applied to a large coverslip placed on a man's finger. The hungry fly (starved for 24 hours) at once attempted to feed through the glass and in so doing smeared the surface with saliva. This was immediately fixed and stained.

Four of the seven infected flies in Experiment 1847 contained swarms of trypanosomes in both the labial cavity and the hypopharynx. Those in the latter structure closely resembled the blood forms of *T. simiae*, whilst those growing in the labial cavity resembled *Herpetomonas*, and are peculiar in having their non-flagellated extremity prolonged to a snout-like extension. They were assembled in clusters and attached by their flagellar end to the inner surface of the labrum, their prolonged free extremity moving vigorously in the lumen of the tube. On examination of stained preparations of the saliva of an infective fly typical blood forms of *T. simiae* were seen. Further examination of flies by inducing them to salivate on cover glasses revealed the fact that sometimes long, narrow, intestinal forms of trypanosomes are ejected in large numbers, showing that an infected fly has the power of regurgitating the contents of its proventriculus and intestines forward into the labial cavity and probably into the blood stream of the bitten animal. Possibly in this way the proboscis first becomes infected by intestinal forms of trypanosomes which attach themselves to the labrum and enter the lumen of the hypopharynx. Neither the salivary glands nor the salivary ducts beyond the hypopharynx have ever been found infected with *T. simiae*.

The intestines of infected flies were generally packed full of trypanosomes from proventriculus to midgut or sometimes to hind gut. The most numerous forms are long, slender, ribbon-like, very active trypanosomes. It is impossible to differentiate

one species of trypanosome from another by a study of intestinal forms. *T. brucei*, *T. gambiense*, *T. pecorum* and *T. simiae* all present the same appearance. The paper is illustrated by three plates.

The conclusions are as follows:—

1. "That *T. simiae* can be transmitted from infected to healthy animals by the tsetse fly *G. morsitans*.
2. "That *T. simiae* multiplies in the intestines and in the labial cavity of the proboscis of the 'fly.' Here only developmental forms are found, never infective forms.
3. "That the *T. simiae* growing in the intestines of the 'fly' has no specific characters by which it can be distinguished from other species of pathogenic trypanosomes found in tsetse flies.
4. "That the final stage of the development takes place in the hypopharynx, wherein the infective form of the parasite, similar in shape to the trypanosomes found in the blood of infected animals, is produced.
5. "That the flies do not become infective until about 20 days after their first infected feed."

Bruce (David), Harvey (David), Hamerton (A. E.), & Lady Bruce. **Trypanosome Diseases of Domestic Animals in Nyasaland. III.** *Trypanosoma pecorum.—Proc. Roy. Soc.* 1913. Oct. 1. Vol. B 87. No. B 592. pp. 1-26. With 6 charts.

This is one of the most important trypanosome diseases of domestic animals in Central Africa, as it affects them all—horses, cattle, goats, sheep, pigs and dogs. A description is given of the strain from the Mvera cattle, the wild game strain and the wild *Glossina morsitans* strain. The morphology and pathogenicity of the three strains are compared. Morphologically they are identical with one another and with the species found and described in Uganda.

A comparison of the three strains in regard to their virulence towards various animals is given in two tables.

Table XVII.—The Average Duration of the Disease in Various Animals, in days. The letter R means that the animal is refractory, that is, not susceptible to the disease.

Strain.	Donkey.	Ox.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White Rat.
Mvera Cattle ...	87?	103?	64			34	R	R
Wild Game ...			56		142	74	R	30
Wild *G. morsitans*		140	46	21	117	37	41	37

On the whole it may be concluded that the wild *G. morsitans* strain is the most virulent.

Table XVIII.—The Percentages of Recoveries in Various Animals from the Three Strains. The letter R stands for refractory.

Strain.	Donkey.	Ox.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White Rat.
Mvera Cattle ...	80	37	14			0	R	R
Wild Game ...			17		0	0	R	0
Wild *G. morsitans*		0	6		0	2	0	0

In Nyasaland the carrier of *T. pecorum* is *G. morsitans*, of which 4·6 per 1,000 were found infected by this species. This is the minimum, but the real proportion of infected flies is probably three or four times as great. An account of the development of the parasite in this tsetse fly is to be given in a future paper. There is also some evidence derived from the outbreak among the Mvera cattle that, given infected animals in a herd, it is possible that Tabanidae, Haematopota, or other biting flies may act as mechanical carriers. The evidence that Stomoxys plays a similar rôle is unsatisfactory.

The conclusions are:—

"1. The Mvera Cattle strain, the Wild-game strain and the Wild *G. morsitans* strain belong to the same species of trypanosome, *T. pecorum*.

"2. *T. pecorum*, Nyasaland, is identical with the species found and described in Uganda.

"3. It is an important disease of domestic animals in Nyasaland, being destructive to donkeys, oxen, goats, pigs, and dogs.

"4. Its carrier in this district is *G. morsitans*, about 2 per cent. probably of the local wild flies being naturally infected with *T. pecorum*.

"5. Its reservoir is the wild game inhabiting 'fly-country,' 14·4 per cent. of which were found to be infected with this trypanosome. It is hardly to be doubted that 100 per cent. are, or have been, infected.

"6. It is recommended that if infected animals are found in a herd they should be destroyed or segregated, as there is a danger of biting flies other than the tsetse spreading the disease in the herd by mechanical transmission."*

W. Y.

Treatment.

Kopke (Ayres). **Traitement de quelques Cas de Trypanosomiase Humaine par le Salvarsan et le Neosalvarsan.**†—*Med. Contemporanea.* 1913. Sept. 14. Vol. 31. No. 37. pp. 289-292.

The author refers to his observation at the Fifteenth International Congress of Medicine at Lisbon in 1906 that it is impossible, by means of atoxyl, to cure those cases of sleeping sickness in which the trypanosomes have invaded the cerebrospinal fluid. He is still of this opinion and considers that from the aspect of prognosis cases of sleeping sickness can be divided into two categories, viz., those in which the trypanosomes have invaded the cerebrospinal fluid and those in which they have not.

A number of sleeping sickness patients with invasion of the cerebrospinal fluid were treated at Lisbon with salvarsan. The doses given were ·3 to ·6 gm., except in one case aged 10 which received only ·1 gm. and ·15 gm. The injections were given

* In the course of this paper the authors write:—"It is certain that it is only by the detailed study of many strains of each of the African species of trypanosomes that a satisfactory classification of this important group of haematozoa wil be arrived at. This work must be done on the spot, where the natural conditions for the normal life of the parasite are present, and where frequent opportunity of passing through the invertebrate host—the tsetse fly—exists. It is absurd to expect to arrive at any classification at all approaching a true one by the study of strains of trypanosomes kept for many years and undergoing many vicissitudes in our European laboratories."

† Communication presented at the XVII. International Congress of Medicine, London, August, 1913

intravenously and repeated at intervals of 8 to 10 days; the total number of injections was generally 3, but two patients received 7 injections. The results are given in a table. Of the 15 patients so treated ten are dead. Of the remaining five one has had two attacks of hemiplegia of the right side with aphasia and will probably die in a short time. In patients who present nervous symptoms the author has not observed after treatment with salvarsan the same amelioration that is obtained with atoxyl.

Subarachnoidal injections of neosalvarsan were given in two cases. The first case presented marked nervous symptoms and trypanosomes were fairly numerous in the cerebrospinal fluid On January 10, 1913, 16 cc. of cerebrospinal fluid was withdrawn and 10 cc. of a solution (1·5 per 1,000) of neosalvarsan was injected. The injection was followed by pain in the legs, tremors and rise of temperature. The following day there was vomiting, tympanites and constipation. The general condition remained aggravated and the patient died on April 14, 1913. The second case presented less well-marked nervous symptoms. On December 24, 1912, 15 cc. of cerebrospinal fluid was withdrawn and 10 cc. of solution of neosalvarsan injected. There followed symptoms similar, but slighter, to those described above. The patient died on May 7, 1913.

In still another case neosalvarsan was injected intravenously. Doses of ·45 gm. were given on November 30 and December 7 and 18, 1912. Eleven days after the first dose pericorneal injection of the right eye appeared, accompanied by visual trouble of the same eye. Examination revealed a retinitis with small haemorrhages around the optic nerve. Psychical symptoms appeared on November 12, 1913, and gradually became accentuated until death which occurred on March 25, 1913. The patient suffered also from syphilis.

W. Y.

Heckenroth (F.) & Blanchard (M.). **Le Neosalvarsan dans le Traitement de la Trypanosomiase humaine.**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 591-592.

The results are given of treating 25 cases of human trypanosomiasis by a single injection of neosalvarsan. The drug used was the neosalvarsan of Ehrlich and was dissolved in the proportion of ·45 gm. in 25 cc. of freshly distilled water. This solution was injected intravenously. The dose administered varied from 1 cgm. to 2·1 cgm. per kilo of body weight. Of the 25 patients treated, 16 in good condition and 9 in moderate or bad condition, four were not re-examined, nine remained free from relapse after an average of 4½ months, two died 3 months and 1½ months respectively without relapse, and the remaining ten relapsed after an average of 2½ months.

Although neosalvarsan caused rapid disappearance of the trypanosomes from the circulation for a certain period it does not appear to act regularly on the trypanosomes contained in the

glands. Numerous active parasites were observed in the gland juice 24 hours, 48 hours and 7 days after doses of 1·7 cgm. per kilo of neosalvarsan.*

W. Y.

Monfort (F.). **Essais de Traitement des Trypanosomiases expérimentales par l'Arsénophénylglycine.**—*Bull. Soc. Path. Exot.* 1913. Oct. Vol. 6. No. 8. pp. 588-590.

Adult mice of 15 to 20 gm. infected with various trypanosomes —*T. gambiense, T. rhodesiense, T. dimorphon* and *T. congolense*—were treated with arsenophenylglycin. A 2 per cent. solution of the drug was injected intramuscularly; the dose was generally 3 mgm. Mice were found to stand 6 and 9 mgm. without exhibiting signs of intoxication. As a result of these four series of experiments the author concludes that the drug is very active against the two varieties of human trypanosome. The sensibility of *T. dimorphon* to the medicament is equally great, whilst *T. congolense* appeared completely refractory, as even doses of 6 and 9 mgm. only produced a very short sterilisation.

W. Y.

Bionomics of Glossina.

Fiske (William F.). **The Bionomics of *Glossina*; A Review with Hypothetical Conclusions.**—*Bull. Entomol. Research.* 1913. Sept. Vol. 4. Pt. 2. pp. 95-111.

There are certain frequently observed and rather mysterious phenomena associated with the bionomics of the better known species of *Glossina;* such, for example, as the local disparity between the sexes and the apparently arbitrary distribution of the fly. It is difficult, if not impossible to explain these, or at least no explanation has yet been put forward which is wholly in agreement with all that has been recorded of the subject. It appears necessary in consequence to consider some part of the generally accepted bionomic history of these flies as being based on insufficient evidence.

The author attempts in this paper to locate the source of possible error, and to formulate a hypothetical bionomic theory which will explain the curious phenomena mentioned and which is closely in accord with generally accepted theories.

As a result of his review of the subject the author comes to the following conclusions which are presented more as a target for criticism than in the expectation that they will be accepted as a correct exposition of *Glossina* bionomics.

1. "In East Africa *G. palpalis* finds the most favourable conditions for rapid increase in such localities as are represented by certain islands in the Victoria Nyanza and certain spots along the uninhabited lake shore. Here it increases rapidly from generation to generation.

2. "Inferentially, birds or the large reptiles, and not mammals, furnish the most favourable food. It is suggested that the results of laboratory experiments to determine the effect of a diet of reptilian blood do not apply literally to the conditions in the open.

* More promising results were obtained by Broden, Rodhain and Corin (*see* this *Bulletin*, Vol. 1, p. 129). A. G. B.

3. "The disparity between sexes in the catch seems to be a fair index of the disparity prevailing in the locality.

4. "The superabundant individuals reared under most favourable conditions are disposed of by migration of the females, and the disparity between the sexes is thus to be explained.

5. "These migratory flights of the females are quite distinctly different from the ordinary goings and comings in which both sexes participate. They probably take place during the period following eclosion and fertilisation and preceding full sexual maturity. The general tendency is to pass from more to less favourable breeding grounds.

6. "There is no evidence as to the extent of migratory range. Wide extents of water or of open country probably offer no obstacle to flights of this character.

7. "Through possession of such habits the species would theoretically be enabled to dispense with any other element of 'facultative control' over increase. The failure to discover efficient parasites, pathogenic microparasites, specialised predatory foes, or other natural enemies capable of exercising such control, might thus be explained.

8. "In the absence of efficient facultative control, it must be assumed that, in general, localities where males predominate are favourable and where females predominate unfavourable to increase; that the species maintains itself in the latter only through immigration, and that it would become locally extinct were this to cease.

9. "When localities actually favourable to increase are compared with localities actually unfavourable it is not improbable that points of difference will be discerned, which may be of value for economic application. Failure in the past to discover constant points of difference between given localities that are fly-free and fly-infested is not improbably due to the fact that both may be equally unfavourable, but that certain localities are fly-free simply owing to their distance from really favourable localities.

10. "The extent to which these tentative conclusions regarding the bionomics of *G. palpalis* in a certain geographical region will apply to the same species in other regions, or to other species, is wholly problematical. Different species will probably differ bionomically in detail, but the broader general principles of most favoured hosts, of most favourable type of breeding ground, of automatic control over increase through emigration, &c., if substantiated for one species, will probably apply to all nearly related or perhaps all species in the genus."

W. Y.

Moiser (Bernard). **Notes on a Few Photographs illustrating the Haunts and Habits of *Glossina tachinoides* in Bornu, Northern Nigeria.**—*Bull. Entomol. Research.* 1913. Sept. Vol. 4. Pt. 2. p. 145. With 5 plates.

During the last two years the author has investigated the haunts of *G. tachinoides* in Bornu, Northern Nigeria. These flies are limited to small patches of dense jungle situated along the course of small rivers. They are found in quite localised areas, in close proximity to rivers or marshes where there is water all the year round, and where the ground is covered with tall shady trees, mostly tamarinds, and thick undergrowth of thorns and creepers, with some ebony trees. The possibility that the ebony trees are in some way a factor determining the presence of the flies has often forced itself on the author's attention, for they are invariably to be found in the "belts" and the tsetse flies were never found in any locality devoid of them. The tsetse were most commonly seen resting on the under side of small ebony shoots close to the ground. These shoots have small horizontal branches, devoid of leaves except at the tip, and it is on the under side of these horizontal twigs that the flies come to rest.

A noticeable feature of all the belts examined was the large number of warthog present.

The author writes that he intends to cut down the ebony trees only in a belt to ascertain if this will affect the presence of the flies. The paper is illustrated by ten photographs.

W. Y.

Chalmers (Albert J.) & King (Harold H.). **The Distribution of *Glossina longipennis* (Corti, 1895).**—*Jl. Trop. Med. & Hyg.* 1913. Oct. 15. Vol. 16. No. 20. pp. 320-322. With a map.

This paper gives an account of the geographical distribution of *G. longipennis*. The known area of distribution of this fly extends from about 6° north to 4° south and from about 33° to 47° east. This area includes British East Africa, the south and west of Italian Somaliland, the southern part of Abyssinia, and the south-eastern portion of the Anglo-Egyptian Sudan. The localities in which the fly is found are either desert or semi-desert. When seen in elevated regions it occurs between the rivers and not on their banks. The fact that it is usually a night feeder may explain why it is seldom reported by travellers.

W. Y.

Nägler (Kurt). **Experimentelle Studien über die Passage von *Schizotrypanum cruzi* Chagas durch einheimische Tiere. Teil I.** [Experimental studies on the Passage of *Schizotrypanum cruzi* through indigenous animals.]—*Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Oct. 4. Vol. 71. No. 2/3. pp. 202-206. With 1 plate.

The first portion of this paper deals with the passage of the trypanosome through small laboratory animals at Berlin. The author succeeded in infecting mice, rats, guinea-pigs, rabbits, dogs and a cat, which subsequently recovered, with *Schizotrypanum cruzi*. Canaries, lizards and frogs were refractory. Hereditary transmission from the parent to the offspring does not occur.

Dealing with the cytological characters of the parasite, the author writes that he considers the male and female forms of Chagas to be merely transitional forms. The slender forms are probably young parasites, the broader forms are probably adults and represent the stage before division. In the plate which illustrates the article two dividing forms are figured—the one from the blood of a mouse and the other from the peritoneal fluid examined two hours after death. Contrary, therefore, to previous statements division takes place in the peripheral blood. In well-differentiated Heidenhain preparations a distinct small karyosome is frequently seen. Masses of reserve stuff are sometimes present and may simulate a nucleus.

The statement of Chagas that the schizogony of *Schizotrypanum cruzi* in the organism of man and laboratory animals represents the multiplication of sexual forms and is in consequence a gametogony is left undecided as the author has not

encountered these stages. However, he agrees with CHAGAS that the multiplication of the parasite in the tissues, and in the blood, represents an asexual division which determines the increase of the number of flagellates in the circulation of the infected animal.

Attempts were made to repeat BRUMPT'S work on the transmission of the *Schizotrypanum* by the common bed-bug, *Cimex lectularius* (*Sleeping Sickness Bulletin*, Vol. 4, p. 286). The bugs were attached to a silver wire after the manner described by NÖLLER. No development of the parasite was, however, observed in the bugs. The author explains the apparent discrepancy of his results and those of BRUMPT by the fact that his experiments were carried out in the winter when the climate was possibly unsuitable.

W. Y.

BATTAGLIA (Mario). **Einige durch Trypanosomiasis Dromedarii erzeugte Läsionen.** [Some Lesions produced by Dromedary Trypanosomiasis.] — *Centralbl. f. Bakt.* 1. Abt., Orig. 1913. Oct. 4. Vol. 71. No. 2/3. pp. 182-184.

Reference is made to previous work of the author in which he produced ulcerating granulomata by scarification of the genitals of rabbits with *T. brucei*. On obtaining this new trypanosome of the dromedary (*T. dromedarii*), the author performed similar experiments with it. The prepuce of rabbits was scarified under strict aseptic precautions by means of an injection needle dipped in blood heavily infected with *T. dromedarii*. After four days a hard oedematous patch appeared on the site of scarification; this gradually increased and within eight days a scab formed followed by ulceration and finally a true hard granuloma. In the lesions and oedema of the genitals fully formed parasites were numerous. Oedema of the scrotum and orchitis are rarely seen with *T. brucei*. In dogs and rabbits infected with *T. dromedarii* keratitis was sometimes observed, but this appearance is rarer than in infections with *T. brucei*.

W. Y.

Book Reviews.

Gosh (Birendra Nath) & Das (Jahar Lal). **A Treatise on Hygiene and Public Health with Special Reference to the Tropics.**—xix + 378 pp. 1912. Calcutta: Hilton & Co. [Rs. 3-8 or 5*s*. net.]

In writing on the subject of "Hygiene and Public Health with special reference to the tropics," the authors, in the present immature state of tropical hygiene, must have been confronted with the question whether advanced sanitary methods of Europe should be described and their principles be applied to the tropics, or conditions in the tropics be detailed and selected remedial measures *ad hoc* be considered in direct relation to them. The former is the method followed by Messrs. B. N. Gosh and J. L. Das; and as the authors make an obvious and laudable effort for conciseness, a natural sequel is that the reader, after perusing various methods applicable in temperate climates, is left with the statement that such and such defects exist in India, without radical remedial measures being indicated. This is remarkably so when dealing with ventilation, cooling and construction of houses, where difficulties as to temperature are dealt with. Again, anthrax amongst animals is frequent, and amongst men occasional, in India; hence, some expansion as to the "why and wherefore" would have seemed legitimate, in the interest of prevention, beyond the statement "it occurs amongst animals grazing on damp soil infected previously with the discharge of diseased animals."

Under water-supply, no room has been found for details of the recent excellent bacteriological work of Major Clemesha, I.M.S., and an explanation of the comparative absence of microbes in the middle of the Ganges is given on the theory of Hankin (of 1894) as to a special "antiseptic" being present. In respect to the Pasteur-Chamberlain filter, the loose statement is offered that the candle should be occasionally cleaned "in hot water or the whole may be boiled." Whilst, as to the Berkefeld filter, it is specifically laid down that the candle should be "sterilized" by boiling every third day. The "four-ghurra" filter is held to be satisfactory; the water in the uppermost "ghurra" is to be "boiled and strained" (!) Under conservancy, it is asserted an adult European male passes about 4 ounces of solid excreta daily "while an Indian passes 8 ounces daily." This is a somewhat misleading statement; but the subsequent context shows it is possible that the latter computation should not have been referred to the Indian male, but should have been quoted as, in the authors' opinion, the average amount per head of an Indian population. Such matters may readily be remedied in future editions without materially increasing the size of the volume, should much of the diffuse material collected on the subject of Meteorology be sacrificed.

On the other hand, there is a practical ring in the treatment of the highly important subject of prevention of malaria; after pointing out the utility of larvicides, protective measures, quinine prophylaxis, &c., they state, "that one of the primary measures for the reduction of malaria is efficient drainage and this is of greater importance in India than elsewhere."

The chapter on diet is carefully written and, in this case, the requirements of the Indian are given due prominence; but there is nothing to indicate, European standards being used to arrive at the calculations, that the comparative weights of European and Indian races have been allowed for.

The authors are to be congratulated on joining the still far too small band of indigenous workers, who perceive that in India, as elsewhere, the wealth and contentment of populations are intimately connected with health conditions.

W. G. King.

Rodhain (J.), Pons (C.), Vandenbranden (F.), & Bequaert (J.). **Rapport sur les Travaux de la Mission Scientifique du Katanga (Octobre 1910 à Septembre 1912).** [Royaume de Belgique, Ministere des Colonies.]—254 pp. Impl. 8vo. With 2 plates and 2 maps. 1913. Brussels: Hayez, Imprimeur de l'Académie Royale. [Price not stated.]

This Report gives an account of the work done by the Scientific Commission which left Belgium in 1910. The personnel included three doctors and an entomologist, M. J. Bequaert. The Commission reached Leopoldville in September, and, tarrying at various points on the way, arrived at Bukama in the Katanga in March 1911. A camp was chosen at Sankisia (750 metres) on the road from Bukama to Fundabiabo, near the line of the future railway between Kambove and the Congo. Two members of the Commission worked at the laboratory, while two explored the country from the point of view of tsetse flies and trypanosome infections. The first chapter of the Report (27 pp.) deals with African relapsing fever; chapter 2 (45 pp.) with human trypanosomiasis; chapter 3 (44 pp.) with trypanosomes and trypanosomiases of large mammals; chapter 4 with *Leptomonas davidi* and non-pathogenic trypanosomes of various insects. Chapter 5 is on Haematozoa from the Belgian Congo; chapter 6 deals with various subjects—tsetse-flies, theileriasis, spirillosis of sheep, helminthology and myiasis (see this *Bulletin*, Vol. 2, p. 530). The last chapter deals with the distribution and biology of blood-sucking Diptera in the Belgian Congo, and includes a list of the Diptera that were collected. A map, which is issued under separate cover, shows the Katanga District on a large scale with the distribution of *Glossina palpalis* and *morsitans*. No scale is given and the meaning of some of the marks on the map is not obvious. Part of this Report has been already summarised in the *Bulletin*; others will be reviewed in future numbers (see page 570). The Report contains much that is of value to the entomologist and medical worker in Africa and is well got up. It includes some observations which have been already published.

A. G. B.

Bostock (Leonard). **Health and Sickness in the Tropics. A Guide for Travellers and Residents in Remote Districts.**—x + 94 pp. 8vo. 1913. London: Simpkin, Marshall, Kent & Co., Ltd. [2*s*. net.]

This little book may be recommended for those for whom it was written, namely travellers, sportsmen, pioneers and those who reside in remote districts of the tropics beyond the reach of skilled medical assistance. A very good account of the diseases met with in the tropics is given, and equally important matters such as haemorrhages, dislocations, fractures and wounds are also suitably dealt with. As the author says, much may be done to prevent trivial illnesses becoming serious and the use of a vade mecum, such as the above, should help the uninitiated very considerably.

In its pages such an one will also find everything that is required to be known about personal hygiene, food, drinking water, filters, clothing, head gear, boots, houses, huts and tents. A preliminary study of such matters before going abroad may make all the difference between comfort and discomfort, or health and illness, and it cannot be too strongly impressed upon the tyro that he should possess a book of information such as the above and should follow out the principles there laid down.

There are one or two small details however in the work which are not perhaps quite accurate. The statement that the urine in blackwater fever is usually at first bright red in colour is not correct; such a condition would rather suggest hematuria.

Again in describing the diseases specially spread by water ankylostomiasis infection is included. Possibly in several cases this may take place, but undoubtedly the chief manner of infection is by way of the skin from damp infected earth.

It is useful also to look for mosquitoes when one gets into one's net at night, and if any are there, they must be destroyed before the occupant goes to sleep.

The much quoted statement that the Extractum Cassiae Beareanae is of value in blackwater fever is given. It is doubtful, however, if this drug exerts any such influence on the disease.

G. C. L.

Daniels (C. W.). **Tropical Medicine and Hygiene. Part I. Diseases due to Protozoa. (Second Edition.)**—xv + 277 pp. Demy. 8vo. With 2 coloured plates and 73 figs. 1913. London: John Bale, Sons & Danielsson, Ltd. [7*s.* 6*d.* net.]

A second edition of Part I of Daniels and Wilkinson's Tropical Medicine and Hygiene is now to hand. Amongst other changes it will be noticed that this edition is published under the name of the former author alone, and that, with the index, the work now extends to 277 pages in place of the 264 pages of the first edition. In the preface the author states that an alteration has been made in the arrangement and it is hoped that this will diminish unnecessary repetitions. Amongst the most important of these changes is the omission of the chapter on the general characteristics of the flagellata and the insertion of one on prophylaxis in protozoal diseases as the last chapter of the book. This is a distinct improvement, and as this part of the subject is one of the greatest moment it might even have been extended a little further. There have been no very startling discoveries made in the period of time between the two editions (1909-1913) but still work has been progressive and in the case of some diseases, notably kala azar, has been massive in its amount. The new work on Rhodesian and Nyasaland trypanosomiasis also comes into this time and some of this is duly mentioned. It is practically impossible however to deal satisfactorily with a subject so large as human trypanosomiasis in so short a chapter as 20 pages, though it must be said the author has done his best. The second edition, like its predecessor, will be found to be a useful contribution to the literature of tropical diseases and can safely be recommended to all desirous of studying this quickly growing subject.

G. C. L.

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BOOKS RECEIVED.

Fülleborn (Friedrich). Ueber eine medizinische Studienreise nach Panama, Westindien und den Vereinigten Staaten.—*Beihefte zum Archiv für Schiffs- und Tropenhygiene.* 1913. Vol. 17. Beiheft 7. 65 pp. With 8 plates and 8 text-figs. [M. 4.]

Hall-Edwards (J.). Carbon Dioxide Snow: its Therapeutic Uses (Methods of Collection and Application).—xv + 78 pp. Crown 8vo. With 21 figs. 1913. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd. [3/6.]

Rogers (Leonard). Dysenteries: their Differentiation and Treatment.—xi + 336 pp. 8vo. With 10 plates, 2 charts, and 3 diagrams. (Oxford Medical Publication.) 1913. London: Henry Frowde & Hodder & Stoughton. [10/6 net.]

Russell (Harold) [B.A., F.Z.S., M.B.O.U.]. The Flea. (Cambridge Manuals No. 74.)—xii + 125 pp. With 9 illustrations. 1913. Cambridge: at the University Press. [1/- net in cloth: 2/6 net in leather.]

Scott (William) [F.R.C.V.S.]. Clinical Bacteriology and Vaccine Therapy for Veterinary Surgeons.—xii + 222 pp. Demy 8vo. With 37 text-figs. and 12 plates. 1913. London: Baillière, Tindall & Cox. [7/6 net.]

CONTENTS.

Page.

MALARIA.

BAHR; JAMES & GUNASEKARA: Malaria in Ceylon. (Map and Illustrations) 535–541
SARKAR; SATYARANJAN SEN; ADIE: Malaria in India 541–542
BRÜNN & GOLDBERG: Malaria in Jerusalem (illustrated) 542
LEGER: Malaria in Corsica 544
FALCIONI: Restriction of Malaria to Habitations... ... 544
PEALL: Effects of Malaria upon the Health of Native Mine Labourers in South Africa 544
GOBERT: Malarial Prevention in Tunis 545
O'CONNELL: Meteorology of Malaria 545
KNAB: 546
FRÓES; ACTON & KNOWLES: Diagnosis of Malaria ... 546
BATES: The Etiology of Relapses 546
SWELLENGREBEL: Schizogony of the Female Gametocytes of *L. malariae* 548
DA MATTA: Malarial Pneumonia 549
„ „ Anosmia 550
AUDIAU: Hepatic Enlargement in Malaria 550
DAGORN: Malarial Hemoptysis 550
LUGO-VIÑA Y CARTA: Typhomalaria 550
ANNALES D'HYGIÈNE; DAVIDSON: Splenic Rupture in Malaria 551–552
BATES: Treatment 552
THOMSON (J. G. & D.); BASS & JOHNS: Cultivation of Malarial Parasites... 554–556
ZSCHUCKE; DE HAAN: The Wassermann Reaction and the Müller-Brendel Modification in Malaria 557
BROWN: Renal Complications in Hematin Intoxication... 559
ZOIA: The Haemolytic Power of the Serum in Malaria ... 560
BASS; SHAVER: Eradication of Malaria 560–561
HUDLESTON: Prevention and Cure 561
UNTERBERGER: The Control of Malaria in Russia ... 562
HOROWITZ: The Control of Malaria in Dalmatia... ... 563
STRAITS SETTLEMENTS: Anti-Malarial Work in Singapore... 564
BRUCE, HARVEY, HAMERTON & BRUCE: Malaria in Antelope 564
PARHAM: Quinine and Tetanus 565
BIREAUD: Quinine Idiosyncrasy 566
MALAY STATES: Malayan Anophelines 566

BLACKWATER FEVER.

MACGILCHRIST: The Haemolytic Action of Quinine with Reference to Blackwater Fever 566
RICHTER: Etiology of Blackwater 568
BOYE: Treatment by Anti-venin 569

Page.

SLEEPING SICKNESS.

RODHAIN, PONS, VANDENBRANDEN & BEQUAERT: Report of the Katanga Commission 570
DA COSTA: Sleeping Sickness in Principe... 574
BLANCHARD: The Cycle of Evolution of *T. gambiense* in the Blood 575
MELLO: Has *T. gambiense* an Affinity for the Testis? ... 576
FLEMING: Trypanosomiasis in Southern Rhodesia ... 577
BROWN: A Case of Human Trypanosomiasis in Northern Rhodesia 579
BRUCE, HARVEY, HAMERTON & LADY BRUCE: A Strain of *T. brucei* vel *rhodesiense* in Nyasaland 579
BRUCE, HARVEY, HAMERTON & LADY BRUCE: Susceptibility of Animals to the Human Strain in Nyasaland 580
BRUCE, HARVEY, HAMERTON & LADY BRUCE: Susceptibility of Animals to *T. simiae* 581
BRUCE, HARVEY, HAMERTON & LADY BRUCE: Development of *T. simiae* in *G. morsitans* 583
BRUCE, HARVEY, HAMERTON & LADY BRUCE: *T. pecorum* in Nyasaland 585
KOPKE; HECKENROTH & BLANCHARD: Salvarsan and Neosalvarsan in Treatment of Sleeping Sickness ... 586–587
MONFORT: Treatment of Animals with Arsenophenylglycin 588
FISKE: The Bionomics of Glossina 588
MOISER: *G. tachinoides* in Northern Nigeria 589
CHALMERS & KING: Distribution of *G. longipennis* ... 590
NÄGLER: Susceptibility of Laboratory Animals to *Schizotrypanum cruzi* 590
BATTAGLIA: Lesions produced by a Camel Trypanosome 591

BOOK REVIEWS.

GOSH & DAS: A Treatise on Hygiene 592
RODHAIN, PONS, VANDENBRANDEN & BEQUAERT: Report of the Scientific Mission to the Katanga 593
BOSTOCK: Health and Sickness in the Tropics 593
DANIELS: Tropical Medicine and Hygiene. Part I. ... 594

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